Instruments

E MAGAZINE of MEASUREMENT and CONTROL

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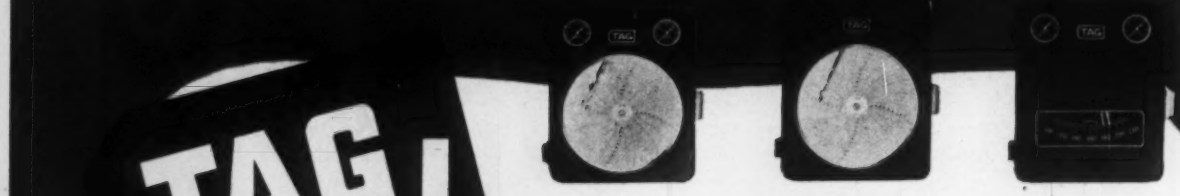

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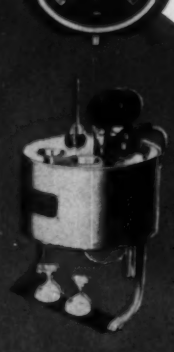

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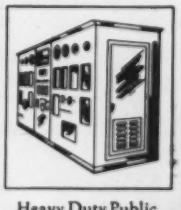

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Instruments THE MAGAZINE OF Measurement and Control

M. F. BEHAR, Editor

THE ATOMIC SUPERSONIC ELECTRONIC PLASTIC INSTRUMENTATION AGE

WHAT will 1949 bring to Instrument Men? To make specific predictions in answer to this question—that was to have been the purport of this page. A year ago the title was "Predictions for 1948" and three specific predictions were set down in black-and-white without equivocation. All came true before October; and some readers recommended that our crystal-ball, which worked perfectly last year and on every previous occasion as far back as 1926, should be gazed into once more.

A couple of weeks ago (Election Day, to be exact) something happened which caused some of these same friends to sing with dire forebodings: "Lay that crystal down, Mal, lay that crystal down!"

Coming from Instrument Men, this advice seems strange, for Instrument Men—most of them, anyway—are supposed to be dedicated to Control. And since Control means influencing the future, it implies ability to forecast the future—to a limited extent, as in the case of process flows and levels, but with assurance.There's nothing mysterious about short-range forecasting based on knowledge of conditions: it's like a housewife predicting that the mince pie will be delicious when she knows that the ingredients, the mixing, and the temperature-time cycle are all correct; more specifically (and more aptly referring to "range") it's like a rifleman predicting a pinwheel when he is shooting National Match ammo from prone with a 'scope-equipped M'06 at a 12-inch bull 100 yards away!

Some Instrument Men possess an extraordinary sense of values insofar as physical phenomena are involved; some of them extend this sense from the physical universe, in which things and organisms exist and function, to the Real Universe, in which sapient beings live and think. Such Instrument Men should be—and often are—among the rare human beings who intuitively grasp the basic principles of the control of human affairs. This does not mean that an Instrument man who earns $15,000 a year because of his outstanding ability in physical technologies—and who is an illiterate in the humanities—would make an accurate forecaster in other fields than his narrow specialties. On the contrary, his opinions on general-interest questions are likely to be mere prejudices, as were the opinions of John Wilkes Booth on national affairs, of Richard Wagner on nearly all non-musical subjects, and so on. But a sense of values, added to a good head, a kind heart and a broad culture, becomes the determinant of clear foresight. If some research institution induced a hundred cultivated men comprising ten Instrument Men and ninety assorted others, to make ten-year forecasts on numerous subjects, the result would be, when the hundred sets of statements were checked ten years later, a higher average score for the Instrumentalians than for the others.

Then, too, there is the inherently GOOD nature of Instrumentation. Of all good men, the best was the Servant of Man. Instrumentation is a servant science, a modest handmaiden of all technologies. Because of her services, the newer "ages" of mankind tend to be less and less cruel, more and more beneficial. Wherefore a long-range prediction may be ventured:

Two short years from now, the first half of the Twentieth Century will be over and the Nucleonic or Supersonic or some other "Age" will have passed its infancy. It probably —almost certainly—will be a COMPOSITE; and its name in the school books of the Twenty-first Century may be non-technical (perhaps a name denoting that wars between nations ceased, as duels between individuals had ceased earlier.) But its wondrous components will have been served and nurtured by Instrumentation: THIS is the prediction. Check it in 2001!

That 1949 will see extensive use of fully-automatic analyzers and their associated chemical controllers is no longer a prediction: the "age" of automatic analysis in the history of Instrumentation has begun. It was predicted eight years ago (March 1940 issue, pages 63, 84-85) and "before 1950" was implied. Some readers sneered at the profusion of technical details in the prediction—details including a classification into ten categories and numerous types and subtypes. Today, on re-reading it, it seems commonplace!

Now for two specific short-range predictions—or, rather, two examples of one predicted radically-novel development, namely, the small "quick-review and quick-action instrument" which does to an ARRAY of instruments what is done today by the human being who uses such an array as one complex but coördinated means. We are not predicting "master controllers": they have already been designed for several arrays. What we predict is an instrument which will (1) make immediate "joint" or "integrated" reports on the time functions of the readings of the numerous already-installed measuring AND automatic-control instruments; and (2) immediately carry out IN DETAIL the logical BROAD decisions of the human supervisor. One obvious application of this dual function is the array of all the flight instruments—including of course the autopilot—on a large airplane;* another is the complicated array of a large chemical-process control board. —MFB

*If any reader thinks this is a wild prediction, let him turn to page 16 of the Sept. 20 *Aviation Week* for a "scoop" by that alert magazine on the Sperry Zero Reader (which probably will not be announced officially until next summer). This instrument "interprets" the flight-instrument readings and the rates of change of their readings, then it commands the airplane controls instantly when the pilot has effortlessly zeroed both cross-pointers. It is a promising beginning!

WILLIAM GAERTNER

As we go to press, word comes that William Gaertner died on December 3 at the age of eighty-four. An editorial tribute to this beloved dean of American scientific-instrument designers appeared in our October 1944 issue on the occasion of his eightieth birthday.

The Counter Reads 0 0 2 5 2

and thereby registers the end of the twenty-first year of *Instruments*' service to users of measurement and control devices—service to the UNITED STATES OF AMERICA

The entire staff of *Instruments* wishes you

A Merry Christmas and a Happy New Year

THE DERIVATIVE CONTROLLER

By V. V. ST.L. TIVY, The Foxboro Co., Foxboro, Mass.

A CONTROLLER'S purpose is to detect and correct for changes in the process being regulated. The control mechanism of an air-operated Recorder-controller, however, responds only to pen motions, in accordance with which it positions a control valve. The pen is actuated by an element which responds to changes which may, or may not, originate in the process. If the Controller were sensitive only to changes in the process, there would be no need of this article; but since some of the motions of the measuring element DO NOT ORIGINATE IN THE PROCESS it is important to consider all motions of the measuring pen in the light of the valve action that will be obtained as a result of them.

Pen motions may be grouped into two classes:

1. All motions produced by changes in the process that originate within the process and which are indicative of real changes in the process variable which is being controlled. (A Controller should recognize and correct for these motions.)

2. All other motions of the pen, some of which originate outside the process. (A Controller *should not* recognize these and any attempt to correct for them is useless and will result in disturbances in the process.) For the purpose of this discussion these motions of the pen will be called "extraneous influences."

These extraneous influences may be caused by one or more of the following conditions:

1. Changes detected by the measuring element but which occur locally and do not travel through the process. It has been found in practice that such variations do occur, but that they are invariably small and of short duration and that they take place at a fast rate. (An example of such an influence can be cited in the case of a Controller whose thermal element is in a pipe carrying a fluid whose temperature is controlled by varying the rate of input of a second fluid which is mixed into the first ahead of the element. If the stream is not thoroughly mixed before reaching the measuring element, the resulting stratification will cause the element to register temperature changes as it is influenced by successive strata passing over its sensitive portion. These variations as detected by the element will be very rapid and, in fact, will include only the time lag of the measuring system; also, they will be of small magnitude.)

2. Mechanical jarring or vibration of the instrument.

Since Controllers in general cannot distinguish between the motions which should be corrected for and those which should not, many applications become quite difficult to handle.

The Derivative Controller to be discussed in this article CAN segregate these motions and either correct for or ignore them, as required. The purpose of this article is to show HOW this result is accomplished.

The condition which permits the instrument to select the motions which require correction, as opposed to those which should be ignored, is that generally the extraneous influences are small and occur much faster than those motions originating in the process. The Derivative Controller makes its selection and applies appropriate corrections on the basis of RATE and TIME.

How "Rate Response" Can Be Obtained

The pneumatic proportioning mechanism of a Proportional Controller is also the basic mechanism of a Derivative Controller. The operating principles of this proportioning mechanism will therefore be reviewed and should be clearly understood as a preliminary to understanding the principles of a Derivative Controller.

The pneumatic circuit of a typical proportional controller is shown in Fig. 1. It is important to remember one basic fact, true of any pneumatic Proportional Controller. Where the controller's output pressure is between 0 and 17 lbs./in.^{2} (where the supply pressure is 17 lbs./in.^{2}) the flapper is "tangent" to the nozzle. The flapper is said to be "tangent" to the nozzle when it is in such position that the pressure in the relay diaphragm will hold the inlet and exhaust ports neither wide open nor fully closed. While the "tangent" position is not an exact point, the range of distance through which the flapper can move (the nozzle throttle-band) and remain "tangent" is so small that for the purpose of this discussion it may be considered a fixed point. Any motion of the flapper will IMMEDIATELY result in a change in relay output pressure (P_1) sufficient to cause the pressure in the proportioning bellows (P_2) to reposition the flapper (Proportioning follow-up action). Thus while P_2 must bear a fixed relationship to flapper or pen position, P_1 does not necessarily maintain this relation.

The pressure P_2 always changes at a RATE exactly proportional to the rate of measurement change and, consequently, the AIR FLOW into or out of the proportioning bellows must be at a rate proportional to the rate of measurement change. (This statement is based on the capacity of the bellows remaining constant. Actually, there is a capacity change, but it is sufficiently small to be ignored.)

The essential part of a simple type of Proportional plus Derivative Controller is shown in Fig. 2. It is apparent that the only difference between it and the Proportional Controller is the addition of the DERIVATIVE RESISTANCE between the output of the control relay and the proportioning bellows.

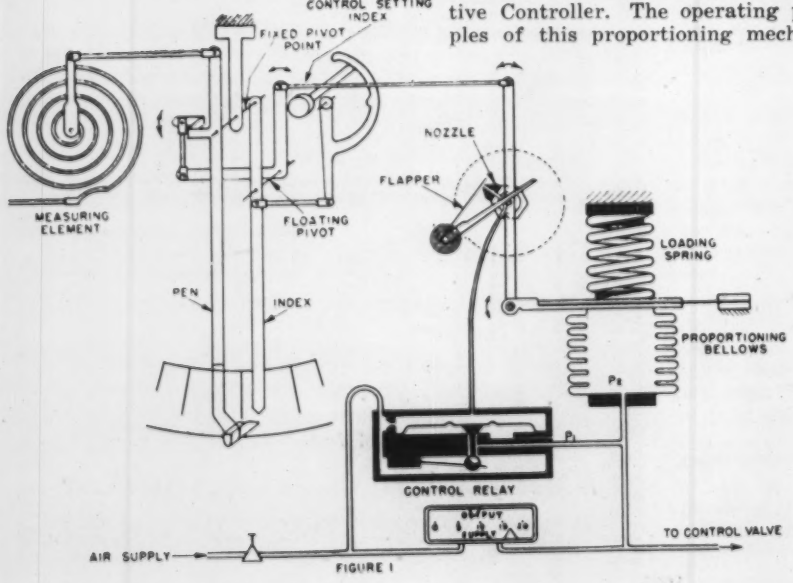


FIGURE 1

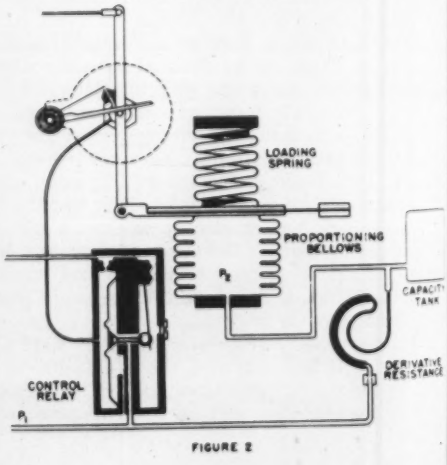
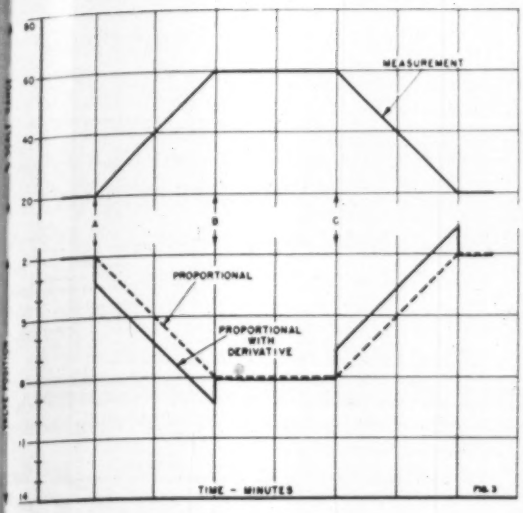


FIGURE 2



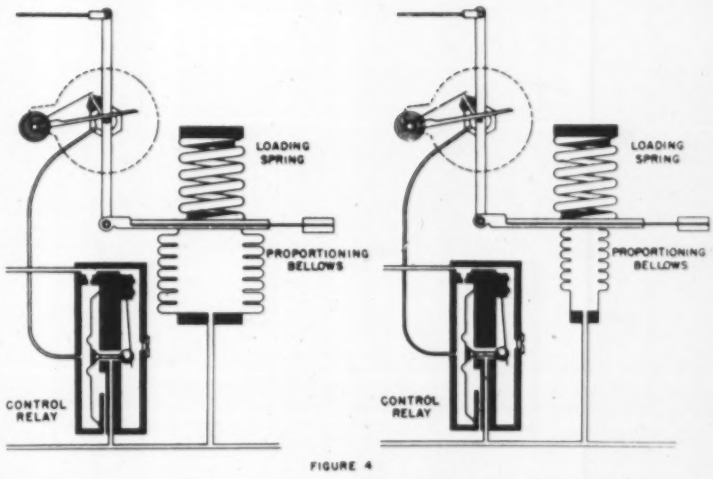


FIGURE 4

In the Derivative Controller, Fig. 2, as in the Proportional Controller, the pressure P_2 in the proportioning bellows is always EXACTLY proportional to pen position and, under conditions of measurement change, it changes at a rate EXACTLY proportional to pen rate. Also, under conditions of change, the flow of air into or out of the proportioning bellows is proportional to pen rate.

As has been established previously, the output P_1 of the control relay will be at whatever pressure is required to cause air to flow into or out of the proportioning bellows to maintain P_2 at the pressure determined by the pen position. It is apparent that under static conditions the pressure P_1 and P_2 in this Fig. 2 will be the same, but that under conditions of measurement change and because of the resistance to air flow between relay and proportioning bellows, the pressures P_1 and P_2 must be different.

Where air is flowing through a capillary-type resistance, the pressure drop across that resistance is proportional to the rate of air flow through it. In the case of this Derivative Controller, since the rate of air flow through the derivative resistance is proportional to pen motion, a pressure drop across this resistance exists which is also proportional to the pen motion. The output pressure of the Derivative Controller is therefore exactly the same as that obtained with a Proportional Controller plus or minus an amount which is the pressure drop across the derivative resistance. Since this pressure drop is proportional to pen rate, it follows that the output pressure of the Derivative Controller is the same as that of a similarly adjusted Proportional Controller, plus or minus an AMOUNT PROPORTIONAL TO PEN RATE. This is known as the "rate response" or "derivative effect."

Fig. 3 compares the output pressures of two Controllers similar in all respects except that one includes the derivative function whereas the other does not. The top curve shows a motion applied to the measurement and the bottom curve traces the output pressure of the Controller responding to the measurement change shown above. It will be noticed that at the moment of pen deviation at a given rate (moment A), the output pressure of the Derivative Controller is increased by an amount which is proportional to that rate and is maintained at that lead over the Proportional Controller's output pressure as long as that rate is maintained. As soon as the measurement RATE ceases (moment B) the derivative effect is withdrawn and does not appear again until there is a further rate of change of measurement (moment C), in this case in the opposite direction, calling for a derivative effect in the other direction also.

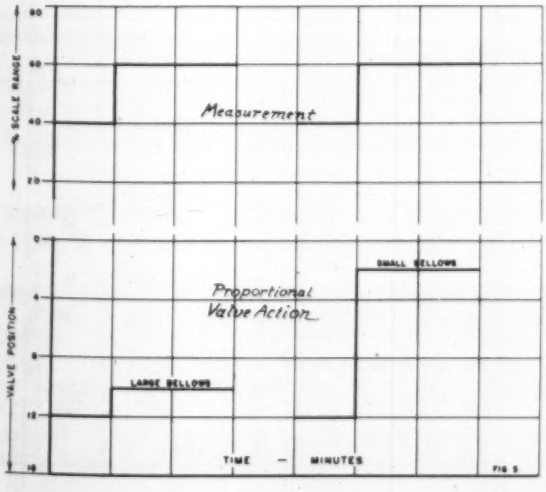
It is important to realize that the derivative effect is proportional to pen RATE only, and that it will be the same for a given rate of pen motion, entirely regardless of the distance through which the pen moves.

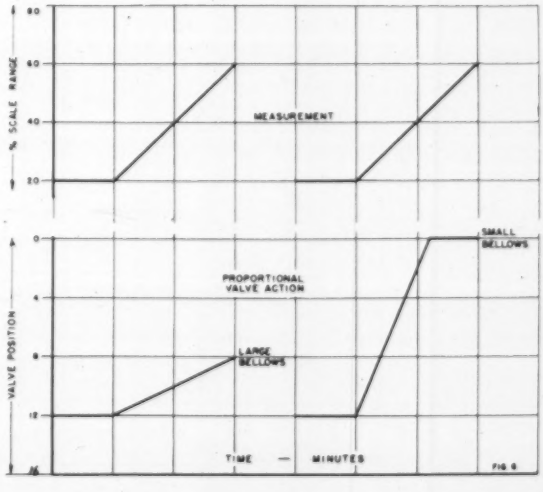
Operation of Derivative Controller with Compound Bellows

Fig. 4 shows the essential pneumatic circuits of two Proportional Controllers with but one difference, namely the size of the proportioning bellows. We can review what the output pressures from these two Controllers will be for equal measurement changes.

In order to simplify the following discussion while we are combining two bellows, it is well to establish some common denominator. This denominator can be the FORCE exerted by the proportioning bellows against the flexure and loading springs.

In order for the flapper and nozzle to maintain their required relationship, the outer end of the flexure spring must be in a position proportional to measurement at all times. Hence, re-





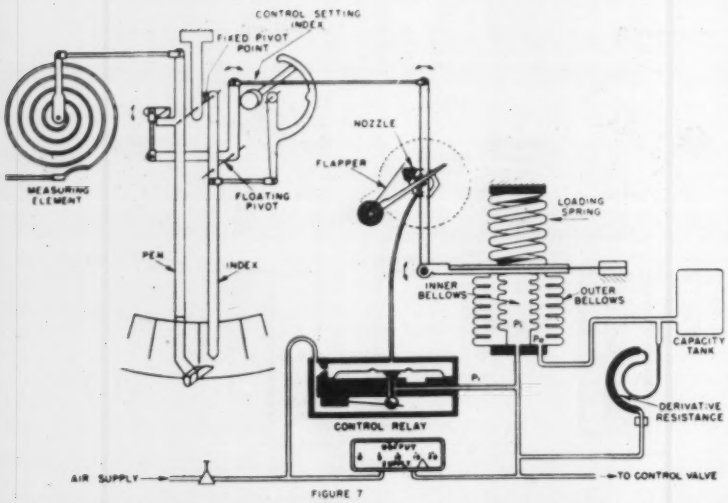
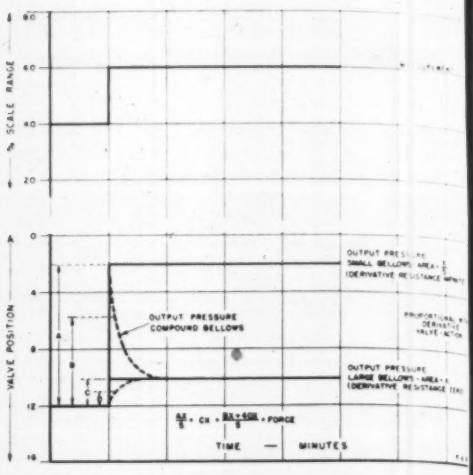


FIGURE 7



gardless of the pressure in the proportioning bellows, the FORCE exerted by it upon the flexure spring must be PROPORTIONAL TO THE MEASUREMENT. Thus, in the case of the two Controllers shown in Fig. 4, for any given change of the measurement the force change exerted on the flexure springs by their respective bellows must be the same. Because the areas of the bellows are in a ratio of 1:5, the pressure change in the small bellows will be five times the pressure change in the large bellows.

The relation between output pressures of the two controllers reacting to a given measurement change is shown in Figs. 5 and 6. It will be noted that the output pressures are proportional to pen motion but that their values are determined also by bellows area.

By combining the bellows shown in Fig. 4 and putting an adjustable resistance between them in the manner shown in Fig. 7, we can reproduce the curves shown in Figs. 5 and 6. With the adjustable resistance wide open, the Controller will perform exactly like the one with the larger bellows, because the output pressure of the relay would be applied in the inner and outer bellows simultaneously. Hence, the bellows area subjected to relay pressure would be the same as that in the simple derivative controller with the larger bellows. If the resistance were closed completely, the Controller would behave like that with the smaller bellows, because the relay output pressure would not be applied in the outer bellows.

When we combine the large and small bellows into one unit, the sum of the forces exerted by them on the flexure spring must be the same as in the case of the units with the single bellows construction, and therefore, for any MOTION OF THE PEN the pressures in the two bellows will adjust themselves so that when multiplied by their respective areas they will produce a TOTAL FORCE CHANGE the same as previously obtained, as shown in this equation:

$$P_1\frac{x}{5}+P_o\frac{4x}{5}=\text{Force change}$$

where:

P_1 = Pressure change in inner bellows;

P_o = Pressure change in outer bellows;

x = Total area of inner and outer bellows.

We can plot, therefore, the output pressures resulting from a sudden motion of the measurement (pen movement) with zero, intermediate and infinite values of the derivative resistance. This is done in Fig. 8. The two solid lines IN THE LOWER CURVE, represent the output pressures resulting from the measurement change shown in the upper curve where the derivative resistances are 0 and infinity respectively. (It will be noticed that these curves are taken from Fig. 5)

Considering the case where the derivative resistance is at an intermediate setting, during the momentary period while the pen is in motion (and realizing that this motion is at an infinite rate) the effect of the outer bellows will be nil (because air will not have had time to flow through the derivative resistance) so the output pressure will build up to the upper solid line. At this moment $P_1 = 10$ and $P_o = 0$; hence the change in total force on the flexure spring equals $10x/5$.

As soon as the pressure in the inner bellows is greater than that obtaining in the outer bellows, air will start to flow through the resistance, increasing the pressure in the outer bellows and thereby increasing the force exerted by it upon the spring. This will result in a reduction in output pressure (or inner bellows pressure) so that the total

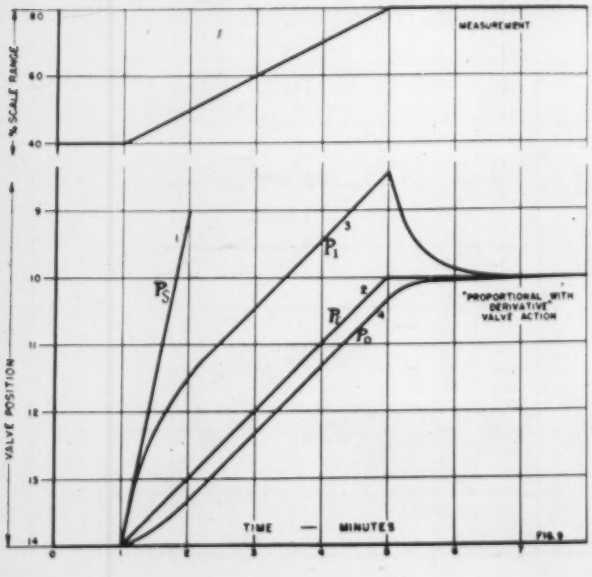


FIG. 9

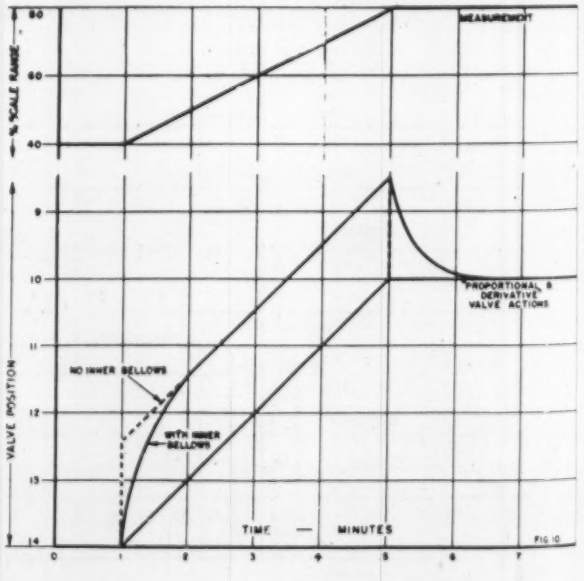


FIG. 10

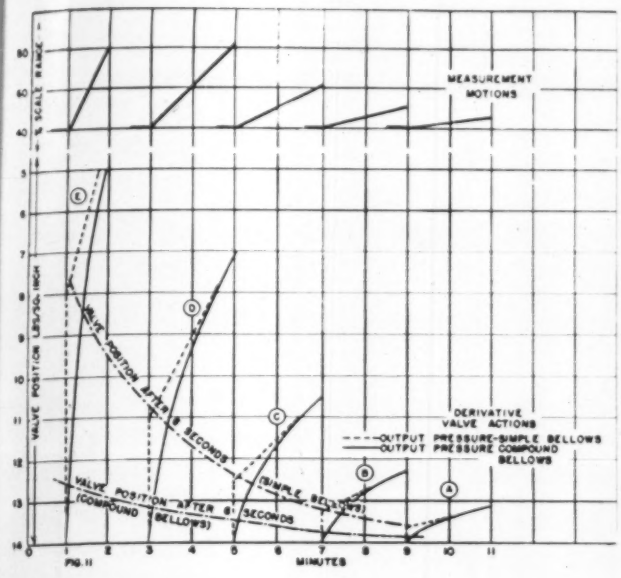


FIG. 11

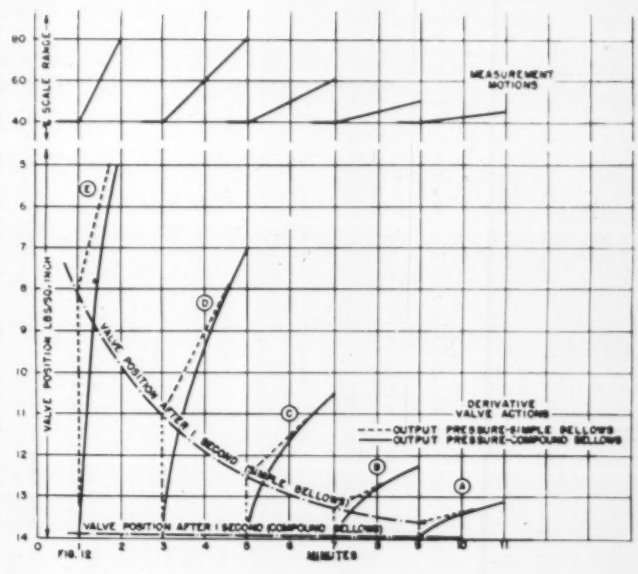


FIG. 12

force remains equal to $10x/5$. For example when $P_o = 1$ (D in Fig. 8) we can determine what P_i is from the equation:

$$P_i \frac{x}{5} + \frac{4x}{5} = 10 \frac{x}{5}$$

Dividing by $x/5$, and rearranging, $P_i = 6$ (shown as B in Fig. 8).

As long as there is no further motion of the measurement, the pressures will continue to equalize along the dotted exponential curves. The time taken for these pressures to change 63% of the difference between the initial and final values is the DERIVATIVE TIME CONSTANT.

Fig. 9 shows a continuing motion of the measurement. Curves 1 and 2 (taken from Fig. 6) are output pressures with the derivative resistance at values of infinity and zero respectively. Curve 3 is the output pressure of the compound bellows unit with an intermediate setting of the derivative resistance. This is the pressure in the inner bellows. Curve 4 is the pressure in the outer bellows. Curves 3 and 4 are derived as follows: At the moment of pen departure at a fixed rate, the output pressure will start off, tangent to the Curve 1, which is the pressure in the inner bellows. The moment that the pressure drop across the derivative resistance is higher than 0, air will begin to bleed through it, building up the pressure in the outer bellows. As the RATE of pressure build-up in the outer bellows increases, the RATE of output pressure increase must be reduced in order that the total force change applied to the flexure spring will always be proportional to the measurement change. This force will always be equal to the pressure represented by Curve 2 multiplied by the sum of the areas of the two bellows. Eventually the output pressure 3 stabilizes at a point higher than 4, and sufficiently high so that it can cause air to continue to flow through the derivative resistance at a rate PROPORTIONAL TO THE RATE OF PEN DEVIATION.

The pressure relation of the four curves is established in the same manner as before.

$$P_s \cdot \frac{x}{5} = P_E \cdot \frac{4x}{5} = P_i \cdot \frac{x}{5} + P_o \cdot \frac{4x}{5}$$

where

P_i = Pressure in inner bellows, compound unit, (curve 3);
P_o = Pressure in outer bellows, compound unit, (curve 4);
P_s = Pressure in small bellows, simple unit, (curve 1);
P_E = Pressure in large bellows, simple unit, (curve 2);
x = Area of large bellows—total area of inner and outer bellows.

It will be noted that the moment that the pen ceases to move, the pressure in the two bellows will start to equalize and will follow the pattern established in Fig. 8. From observation of these curves it can be seen that the output pressure of the compound bellows Controller is, for the greater part of the time, similar to that of a similarly adjusted Proportional Controller plus an amount proportional to the rate of measurement change. This relationship does not hold exactly true at the very start or final points of pen movement, but it has been shown experimentally that this small difference in the derivative effect at one or the other end has very little over-all effect upon the control of a process.

Fig. 10 shows a comparison between the output pressures of a Proportional Controller, a simple Derivative Controller, and a compound bellows Derivative Controller.

CONCLUSION

As stated previously, the purpose of the compound bellows construction is to minimize the reactions of the Controller to extraneous influences. These influences were described as being of small magnitude and occuring at a rate faster than the normal reaction of the process. Fig. 11 is a reproduction of Fig. 10 but for different rates of pen motion, showing only the first part of the curve where there is a difference between the output pressures of the simple and compound bellows construction. For the purpose of comparison, two unequally broken lines show the output pressures that would obtain for the several rates of measurement change, after an elapsed time of 6 seconds. It is at once apparent how much less the output change is in the case of the compound bellows construction, and how much greater the difference is between the two derivative types with faster motions of the measurement. In actual practice, an extraneous influence would never continue for a period as long as 6 seconds, and therefore these two curves show changes resulting from extended influences which are much greater than would normally be the case. In Fig. 12 we reproduce these curves and show the changes in valve position that would occur after an elapsed time of one second. It will be noticed that the change in valve position of the Derivative Controller using the compound bellows construction is small, while in the case of the simple bellows construction the output has changed considerable, particularly in the case of a fast rate of change of the measurement.

The general conclusion that may be drawn from these curves is that for normal rates of change representing normal process changes, the Derivative Controller reacts similarly whether it uses the simple or the compound bellows construction. However, the Derivative Controller using the compound bellows construction will substantially ignore those changes produced by extraneous influences. The simple bellows construction, on the other hand, must react to them as if they were normal process changes.

The derivative function as embodied in the compound bellows Controller may be stated as being to provide a

(*Concluded on page 1130*)

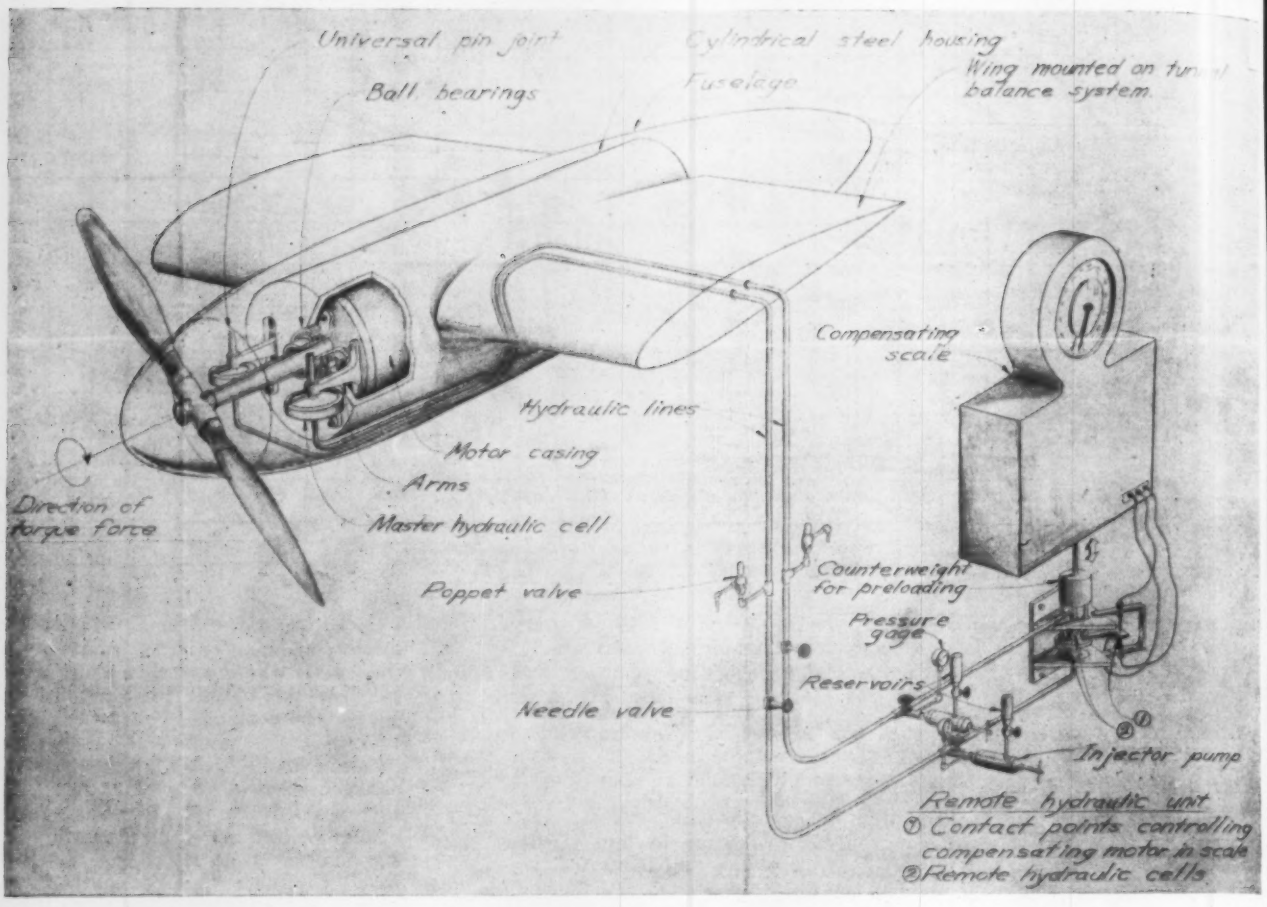


Fig. 1. Pictorial of hydraulic system.

The NACA Hydraulic Torque System *for* Indicating Propeller Torque

By RICHARD J. MOBERG and EDWARD B. PALAZZO, Langley Memorial Aeronautics Laboratory of the National Advisory Committee for Aeronautics, Langley Field, Hampton, Va.

Introduction

Propeller torque forces in wind-tunnel models are measured simultaneously with the thrust and rpm. It is desirable to measure and record these forces quickly, accurately, and with a minimum amount of computation.

Several methods of measuring torque have been used, the strain gage proving one of the best. There are, however, inherent difficulties in the strain-gage method. Some of these difficulties are: high sensitivity required in the gages and indicating equipment, lack of recording devices, the number of operations required to obtain torque values from indicator readings. Also, the gage undergoes large changes in temperature, humidity, and pressure in a high-speed tunnel, which seriously affect the quality of the results.

In an attempt to obtain a more satisfactory torque indicator, members of the staff of the Langley 8-foot high-speed tunnel experimented with hydraulic methods, and developed the present hydraulic torque indicator.

Principle of Operation

The general assembly in the hydraulic torque system is shown in Fig. 1. The propeller dynamometer unit, in which the hydraulic system is installed, consists of a fuselage and wing mounted on the Langley 8-foot high-speed tunnel balance system. With this setup the thrust is measured as negative drag on the drag scale and the rpm. is measured by an NACA tachometer. The dynamometer drive motor is mounted on ball bearings in a cylindrical steel housing which is contained in the fuselage. The motor case then is free to rotate by reason of torque reactions and is restrained only by the two master hydraulic cells shown in Fig. 2.

The scale used is a standard Toledo "Printweight" compensating scale used in the Langley 8-foot high-speed tunnel balance system. The contact points used in the scale were located on the remote hydraulic cells to provide a null system. Consequently, the motion of the pistons of the remote hydraulic cells can be held to within any limits desired. In the present installation the points were set to $\pm 0.001''$; therefore, the total displacement possible is $0.002''$.

The force applied by the torque of the motor is transmitted to the master cells (Fig. 1) through the restraining arms and universal joint pins (Fig. 3). From the master cells the pressure is hydraulically transmitted to the pistons of the remote hydraulic cells. As soon as the remote pistons are deflected, the contact points close, causing the scale linkage to change until the scale load balances the remote-piston load. The remote piston is then returned to null position and the master cell does likewise.

Damping in the system is provided by a dashpot, contained within the scale, and also by a needle valve installed in the pipe line (Fig. 1).

Design Features

Universal pin joints are used to provide self-alinement for the pistons and to eliminate uneven loading of the rubber diaphragms which might cause

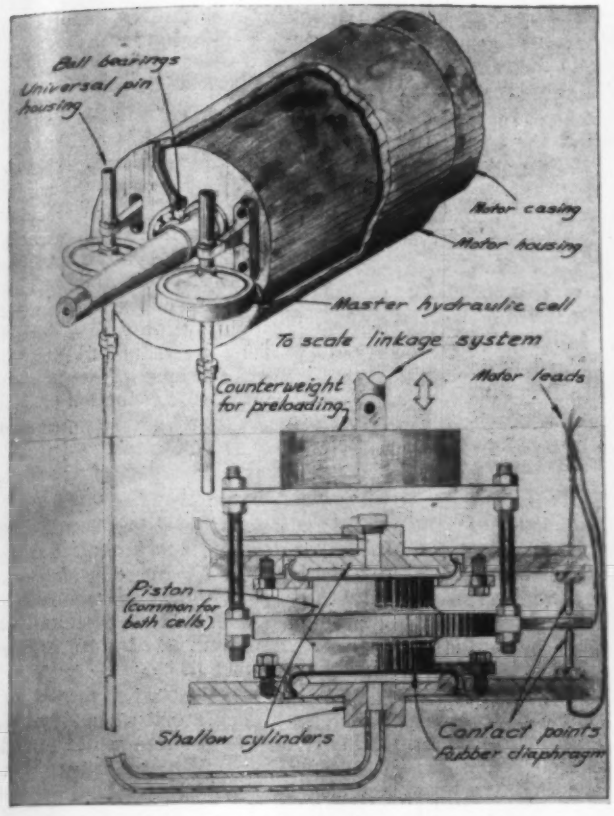


Fig. 2. Details of remote hydraulic cells.

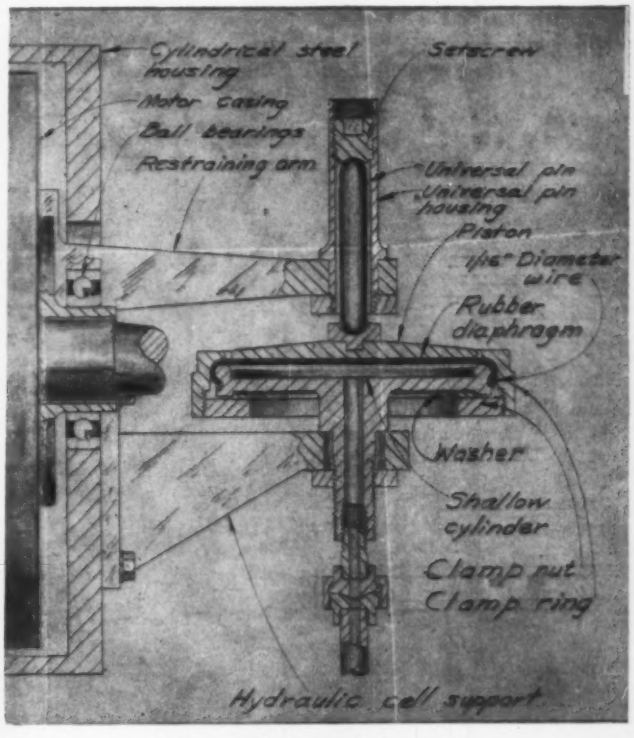


Fig. 3. Details of master hydraulic cell.

them to fatigue easily owing to the small arcual motion of the restraining arm.

It will be noted that two master hydraulic cells are used in the present installation. This arrangement permits measurement of both positive and negative torques. To accommodate negative torque, the scale is preloaded with a counterweight (Figs. 1 and 2). The force measured by the remote cell is the difference between the forces on the two master cells. This difference is independent of ambient temperature and pressure, and independent of differences in ambient temperature and pressure between the two ends of the system, provided that both hydraulic lines are arranged to be equally affected by these items, and the measured force is therefore dependent only upon the torque.

Injector pumps (Figs. 1 and 4), which consist of simple plungers with threaded extensions set in close-fitting cylinders so that they can be moved in or out of the cylinders by attached handles, are located at the lowest part of the system. The injector pumps are so designed that extra fluid can be jumped into the lines to raise the pressure or to replace fluid as necessary.

Pressure gages (Fig. 1) are installed so that the initial pressure in the system can be checked and adjustments made by the injector pumps.

Poppet valves (Fig. 1) have been installed in the system. These valves are set so that, if excessive pressures occur, they will open and relieve the pressure before failure of the hydraulic lines or diaphragms can occur.

Design of the hydraulic cells.—Each cell (Figs. 2 and 3) consists of a piston, rubber diaphragm, and a shallow cylinder. The rubber diaphragm is tightly stretched over the cylinder and fastened with 1/16″-diameter safety wire which embeds itself in a groove on the outside cylinder wall. The diaphragm is further secured by installing the clamp ring which is drawn against the rubber diaphragm by turning the clamp nut (Fig. 3). Clamping action takes place between the clamp ring and the cylinder wall. The clamp ring gives uniform bearing and holds the diaphragm in position.

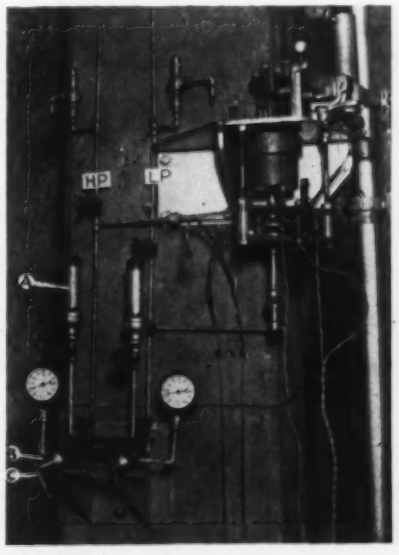


Fig. 4. Torque meter in operation.

The piston itself is cemented to the rubber diaphragm with a 1/16″ clearance between the piston and clamp ring.

The fluid used in the present installation is Lockheed hydraulic brake fluid. The fluid is satisfactory since it does not affect the rubber diaphragms or any other part of the system.

The master hydraulic cell is so designed that both vertical and lateral adjustment may be made at assembly. This is accomplished by threading the universal pin housing at one end and fitting it with a set screw to provide the vertical adjustment, and having a larger diameter hole in the cell support than the diameter of the cell shank, thereby providing lateral adjustment.

The present hydraulic torque indicator was designed for a 200-hp. dynamometer. The range of torque that can be measured is from 0 to 300 foot-pounds. Increasing or decreasing the range depends on the area relationship between the master cell and the remote cell, the strength of diaphragm material and the weight limitations of the scale.

Method of filling the hydraulic system.—One of the problems encountered in the hydraulic system was the method of filling the system without trapping air in the lines. This was accomplished by installing injector pumps (Fig. 4) at the lowest point of the system. The fluid is poured in reservoir *A*, fed into the injector pump *B*, and forced up into the pipe lines by injector pump plunger *C*, thereby forcing the air upward and out of the lines that terminate in the model where the master cells are located. These injector pumps are not only used to fill the system but also to adjust the pressure in the lines.

The individual cells were filled in the

inverted position and the open ends were sealed with thin sheet rubber. The cells having the male part of the union attached to them were then placed over the open ends of the lines having the female part of the union attached to them. As the pipe unions are tightened, the rubber is broken by the sharp edges of the union allowing the fluid to be continuous throughout the whole system.

Accuracy

In normal propeller testing it is desirable to measure torque to within an error of ±1% or less. Percent error for the present installation is defined as the deviation of scale reading from the straight line, divided by the scale reading at that point. The error is based on the value of the torque at the particular point rather than on the full-scale value because the value of error thus obtained is a direct indication of the maximum attainable accuracy of the value of propeller efficiency computed for that point.

Fig. 5* shows a typical calibration curve with percent error curve for this calibration. Of the several calibrations made, all were essentially the same and none deviated appreciably from the typical calibration presented. Inspection of this figure shows that the accuracy in the lowest 20% of the torque range does not come up to the desired value. However, for the tests in which the device was used, this part of the range was of minor importance. Moreover, the absolute accuracy of measurement of torque is essentially the same throughout complete range of operation. The accuracy above 20% of the torque range increases rapidly to a value well beyond that required. The accuracy in the low-torque range could probably be improved, if desired, by changing the ratio of piston areas.

The accuracy of the compensating scale determines to a great extent the over-all accuracy of the system. There appears to be little friction in the mechanism of the hydraulic system itself. No calibration of the Toledo "Printweight" scale was made to determine its accuracy. Therefore, the calibration made includes the combined accuracy of the hydraulic systems, motor mount bearings, and Toledo scale.

The hydraulic torque indicator has been used in an extensive propeller testing program and during its use has provided the required accuracy.

Service Use

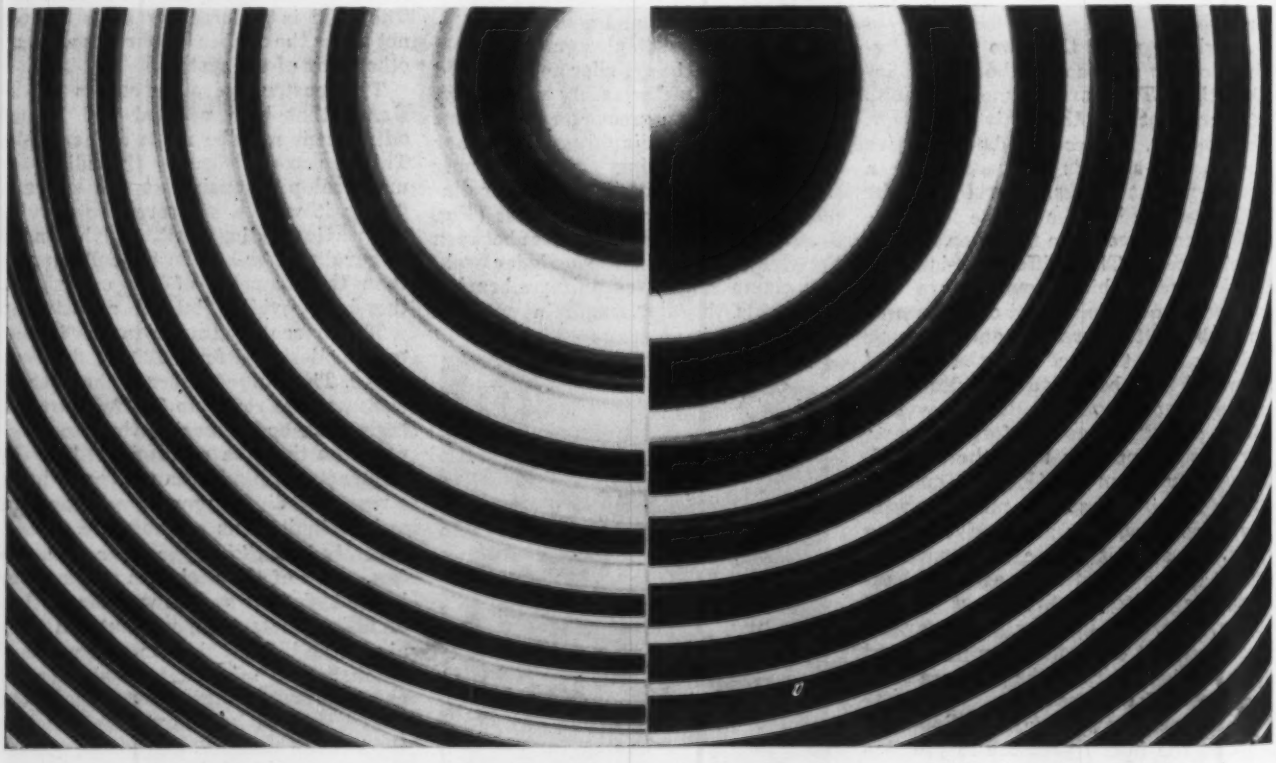
There are several advantages in using the hydraulic torque indicator. The system incorporates a "Printweight" scale which automatically records the torque readings simultaneously with the recording of the other force data, thereby eliminating extra personnel that have been required with other systems. Because the calibration of the torquemeter is a straight line, the data have only to be multiplied by a constant to give the final value of the torque in foot-pounds, thereby simplying the reduction of data to a minimum. It should be noted that a direct reading of the torque is possible by proper calibration of the scale dial face.

This system as used has been shown to be dependable and requires little maintenance. In 2½ months of operation the torque indicator required no maintenance. Since it is essentially a null system, movement of parts is practically non-existent.

This torque indicator has proved satisfactory in operation where changes and differentials of temperature, humidity, and pressure occur, since these changes have no appreciable effect on its operation.

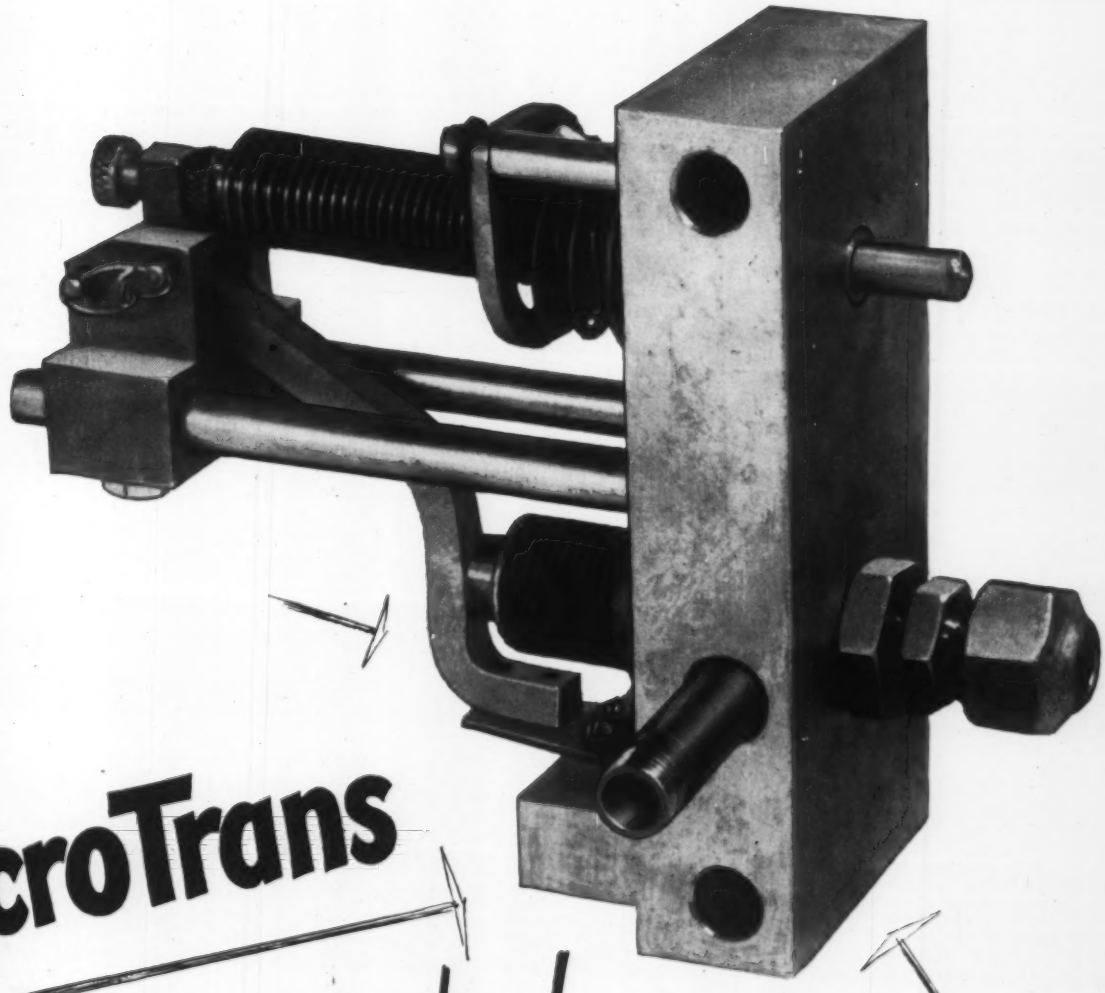
*Editor's Note.—Omitted because original graph (19" wide and 20" deep) could not be reduced to convenient size — say quarter page — without losing details. The largest errors are less than 3% and the largest error between 20% and 100% of scale range is less than 1%.—MFB

INSTRUMENTS ON THE MARCH



STANDARD OF LENGTH

In our May 1948 issue, page 458, the article "Mercury-198 Line as Length Standard" described, with two diagrams and a photograph, the proposal by Dr. William F. Meggers, of the National Bureau of Standards, that the wave-length of green radiation from mercury isotope 198 be adopted as the standard of length because in precision, reproducibility, and convenience, this standard is superior to all others. Striking evidence is offered in a photograph just released by the NBS. A portion of this 8"×10" photograph appears above: it shows interference fringes formed by the green radiation of natural mercury (left) and of mercury-198 (right). This spectral line represents the ultimate in sharpness and intensity that can ever be obtained from any atom, either natural or artificial. Dr. Meggers has measured it with an accuracy of one part in a hundred million. One part in a billion is theoretically possible.



MicroTrans wants work!

Hagan MicroTrans converts extremely small linear movement into a loading pressure which can be used to actuate indicating, recording or control devices. Record of position can be produced in a standard pressure recorder. Loading pressure is directly proportional to movement. Repetitive accuracy is within ± 2% of full scale.

The standard MicroTrans unit measures travel of the contact number through a maximum stroke of 0.25 inch. Contact pressure varies from 3 pounds to 6 pounds. The assembly is small and compact, and weighs approximately 8 pounds.

MicroTrans was designed originally to measure the expansion of a turbine rotor. On that job, it is giving general satisfaction—but there must be many other applications.

If you think MicroTrans may be the answer to some problems of yours, tell us about it. Our engineers will be glad to cooperate. Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

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The Month's NEW INSTRUMENTS

In this department we report each month new devices for measurement, inspection, testing, metering and automatic control—in the form of concise technical descriptions.

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Pneumatic Transmitter with Square-root Extraction

New pneumatic transmitter is especially designed for applications (such as flow-rate) where output pressure must vary as the square root of the force impressed on its measuring element—usually a diaphragm for measuring a pressure difference. Fig. 1 is a much-simplified schematic diagram of new transmitter's design. To produce desired output pressure, reaction mechanism is so designed that reaction force

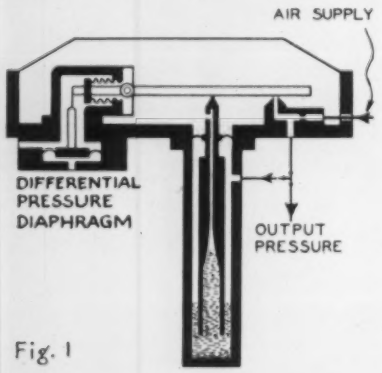
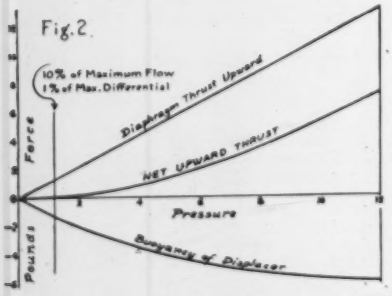


Fig. 1

varies as square of reaction diaphragm pressure. Attached to reaction-diaphragm post is a mercury-sealed bell, the inside of which is vented to atmosphere through the post. Lower end of bell is submerged in mercury, which buoys up bell and produces an upward thrust which adds to that produced by output pressure on reaction diaphragm. As output pressure increases, however, mercury will be depressed around outside of bell and will rise inside, with a consequent decrease in buoyancy of bell. As bell loses buoyancy, its weight must be supported by the reaction diaphragm and therefore subtracts from upward

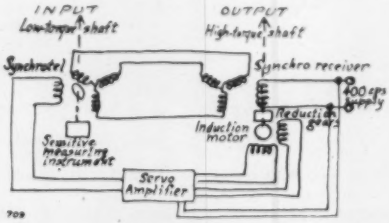


force produced by reaction diaphragm. Bell is so shaped so that variation in buoyancy with change in output pressure requires an output pressure proportional to square root of differential pressure on measuring diaphragm. Relation of forces developed is shown by the curves in Fig. 2. Theoretically, new transmitter could extract square root down to zero measured force, but it would become unstable in its own operation at zero. As a practical matter, therefore, it is built so that it extracts square root down to 10% of maximum flow (1% of maximum differential) and produces uniform increments of output pressure change with uniform increments of differential pressure between zero and 10%. New transmitter differs from conventional mercury-float type instrument (which extracts square root by means of a shaped chamber or bell) in that quantity of mercury is not critical as far as shape of calibration curve is concerned: a change of 1/32" will not cause a measurable change in shape of curve. Output pressure of new transmitter may actuate remote indicators, recorders or controllers. From a measurement standpoint, uniform scale thus made possible is easier to read over a wide range of flow variation. From a control standpoint, uniform response is desirable where there is a large variation in flow-rate; where flows must be matched, added or subtracted, uniform response is mandatory.—*Republic Flow Meters Co., 2240 Diversey Parkway, Chicago 47, Ill.*

Please mention number 1201 when filling out card

Dragless Pointer-position Transmitter

New model of "Synchrotel" has electrical output increased 500 percent, and weight and volume decreased to one-third, of those of former unit (fully described in *Instruments*, Sept. 1947, page 842). Announcement emphasizes

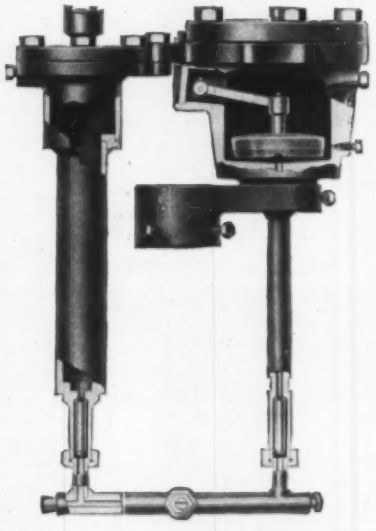


also that price of standard instrument is "a fraction" of that of previous type. New "Synchrotel" functions as an inductive type pick-off where driving torque is so small that a conventional synchro cannot be used. Its rotor weighs 0.75 gram (0.026 oz.). It is readily adaptable to aircraft flight and engine instruments and may be incorporated within the case of a regular dial-and-pointer instrument or in a remotely-located blind transmitting instrument. Among applications: airspeed and altitude controls for autopilots, air traffic laminar controls, computer inputs, telemetering, etc. It can be used in most conventional synchro systems.—*Kollsman Instrument Div. of Square D Co., 80-08 45th Ave., Elmhurst, N. Y.*

Please mention number 1202 when filling out card

Precision Manometer

New "Model 1500" mercury manometer for flow-rate, liquid level and differential pressure measurement is designed for 1500 lbs./in.^{2} working pressure and is available in ranges of 10" to 400" of water. It is built for use on indicating, recording or controlling instruments and two manometers can be mounted on a single case for recording two flows or ratio flow control. Among features: (1) Greater energy output made possible by use of a large-diameter float and long float travel. (2) Spe-



cially designed pressure-tight bearing of stainless steel with Teflon bearing surfaces: self-lubricating characteristic assures no freezing, minimizes friction and gives leak-proof performance. (3) Positive overrange protection provided with positive-acting, non-sticking check valves submerged in mercury. (4) Leakless damping adjustment under full-rated pressure assured by means of unique damping device. (5) Interchangeable range chambers contribute to adaptability of new manometer which now gives continuous ranges from 10 to 533" of water; no piping changes are necessary when changing from one range to another. (6) Straight-line calibration an inherent feature.—*Taylor Instrument Companies, Rochester 1, N. Y.*

Please mention number 1203 when filling out card

Flowmeter Calibrating Stand

New "Type 9" is a gravimetric (weight method) calibrating stand for high-capacity rate-of-flow indicators for liquids. It supplements "Types 7 and 8" by extending range to 30,000 pph. Basic construction and operation are the same as "Type 7" (used since 1941 and said to have been standard for government agencies and aircraft carburetor manufacturers). Major improvements have

been made. Entire mechanism is built into a steel frame fully enclosed by metal panels. Recesses are provided for access to Scale Beam, Scale Pan, Weights, and Photocell Control. To left of Scale Recess is Control Panel with Electric Interval Timer, Pressure Gage, Shut-off Valve, Thermometer, Micrometer Flow Control Valve, and Dump Valve Control Lever. To left of Control Panel is space for setting up flowmeters for calibration. Single- or multiple-stage flowmeters are easily installed and interchanged. Portability of the stand permits moving it to a convenient location and, by means of flexible hose connections, calibrating flowmeters without removing them from their regular mounting. 60-gallon Weigh Tank is sensitively balanced on self-aligning knife edges on master scale beam which is linked to scale pan and tare weight beam. A set of master weights is provided. Photocell Unit is built into an explosion-proof case. Downward motion of tare weight beam causes an attached vane to cut off light on photocell. This light cut-off actuates a sequence relay which in turn alternately makes and breaks clock supply circuit. Timer is graduated in seconds and tenths and operates on 110-volt 60-cycle current. Where frequency is not held accurately at 60 cycles, corrective equipment is available as an extra. Calibrating liquids such as alcohol, kerosene, show average repetitive accuracies within ±1/20 of one per cent.—*Commercial Research Laboratories, Inc., 20 Bartlett Ave., Detroit 3, Mich.*

Please mention number 1204 when filling out card

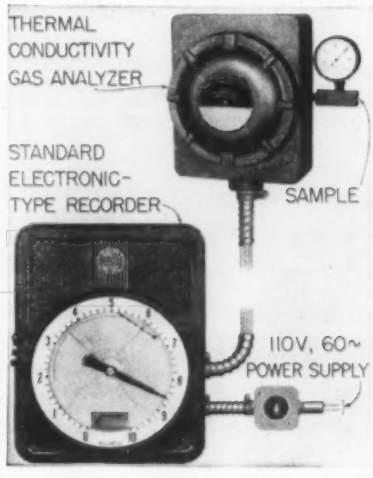
Portable Radiation Survey Meter

New "SU-1A" radiation survey meter has 3" scale calibrated directly in milliroentgens per hour. Three scale ranges of 25, 250 and 2500 milliroentgens per hour permit precise readings to be made from well below tolerance dosage rate to values far above those normally encountered in most radioactivity laboratories. Batteries need be renewed only after approximately 1000 hours of operation. Movable circular shield permits differentiation between beta and gamma radiation. Convenient pistol-grip handle and light weight (5 lbs.) afford easy portability. Suitable for monitoring radioisotopes and x-rays of energies as low as 50 kv.—*Tracerlab, Inc., 55 Oliver St., Boston, Mass.*

Please mention number 1205 when filling out card

Continuous-recording Gas Analyzer

New thermal-conductivity type recorder, now added to maker's line of automatic gas analyzers and recorders, utilizes standard principle of thermal-conductivity gas analysis which measures rate at which heat is conducted by

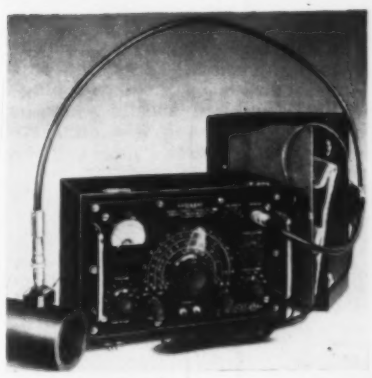


the gas being sampled. Analyzer is mounted in an explosion-proof case and is unaffected by voltage variations, ambient temperature, and variations in sample pressure. All-a-c. circuit permits use of maker's standard Electronic Recorder which does not require dry batteries or a standard cell. New analyzer is said to be unusually stable and fast in response. It requires no manual attention or adjustment except for routine maintenance. Measuring circuit employs an a-c. potentiometer (null balance principle). Voltage drop across sample cell is automatically balanced against voltage drop across a motor-driven slide-wire unit. Recording pen is connected to slide-wire unit. Two records of thermal conductivity can be placed on one 12"-diameter uniformly-graduated chart or one record may be combined with another of flow, pressure, temperature or other related factor.—*Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.*

Please mention number 1206 when filling out card

Resonance-type Thickness Gage

New "Model FMSS-5 Audigage" utilizes same principle as first model (described in Jan. 1947 *Instruments*, page 59) and serves same purpose: non-destructive thickness measurement from one side. Its general design is similar but it contains new features:

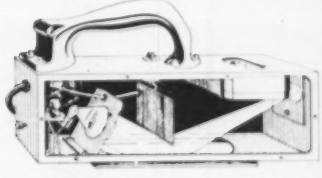


(1) Earphones supplemented by instrument indications for use in noisy locations; (2) adjustable frequency modulation to facilitate the measurement of seriously corroded equipment; (3) special permeability tuning unit for increased sensitivity over entire frequency range; (4) increased frequency range for measurement of steel down to 1/16". Special ranges can be provided for thinner materials. New instrument is portable and battery-operated, for field use. A-c. power supply can be furnished if desired.—*Branson Instruments, Inc., Joe's Hill Road, Danbury, Conn.*

Please mention number 1207 when filling out card

Reflectometer

New 0°, 45° reflectometer embodies high-sensitivity lightmeter, photocell correction filter (for colored surfaces),



and flashlight light source. For use in measuring directional reflectance from painted surfaces according to A.S.T.M. Method D771-47. Accuracy of ±2% is claimed. Instrument is furnished with two working standards for use with 110 volts a.c., for battery operation, or both. —*Henry A. Gardner Labs., 4723 Elm St., Bethesda 14, Md.*

Please mention number 1208 when filling out card

Portable Radiation Survey Meter

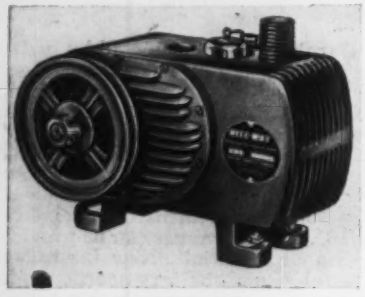
New portable "Model 101" survey meter measures only 5⅜" × 6½" × 4½", weighs less than 7¼ lbs. and has replaceable plug-in unit incorporating all

major components. Meter has new, light weight, weather-proof probe and cable assembly. Instrument detects both beta and gamma rays by means of plug-in "G-M" tube and has especially long battery life.—*Precision Radiation Instruments, Inc., 1101 North Paulina St., Chicago 22, Ill.*

Please mention number 1209 when filling out card

Vacuum Pump

New "Rite-Way" rotating plunger type vacuum pump develops 28½" of vacuum on blank test. With 15" of vac-



uum and speed of 1,700 rpm., pump capacity is rated at 4½ cu. ft. of free air per minute. Unit features built-in muffler and sealed-in lubricating system. Rotor is eccentrically mounted on a shaft rotating counter-clockwise within cylinder bore. There is no lost stroke; intake air mixes with oil which flows through pump, lubricating all parts and sealing clearances. Oil vapor is condensed in muffler chamber and returns to exhaust chamber.—*Rite-Way Products Co., 1241-7 Belmont Ave., Chicago 13, Ill.*

Please mention number 1210 when filling out card

Pressure Gage for Chemicals and Viscous Liquids

New "Chemical Gage" is particularly suitable for chemicals and other viscous liquids which corrode or clog Bourdon

tube. Feature is diaphragm made of Teflon, which satisfactorily resists practically all corrosive chemicals, and makes it possible to supply gage for vacuum and for compound ranges as well as for pressures as high as 1600 lbs./in.^{2} and for temperatures (at gage) of 300°F. Removable bottom part and diaphragm ring are supplied in cast iron, bronze, steel, stainless steel, Hastelloy, lead-coated iron, and Monel. —*Helicoid Gage Division, American Chain & Cable Company, Inc., Bridgeport, Conn.*

Please mention number 1211 when filling out card

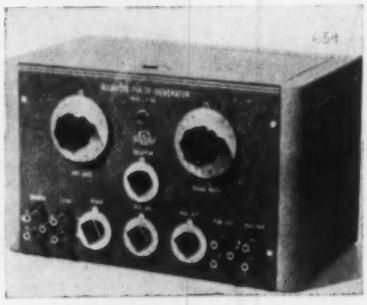
Vacuum-insulated Laboratory Flasks and Beakers

New vacuum-insulated flasks and beakers feature a flat bottom and recessed seal-off tip; are silvered internally and evacuated to a high vacuum; are constructed of sturdy-wall Pyrex tubing and thus are more rugged than conventional type with round bottom and exposed evacuating tip. Flat bottom and recessed tip eliminate need for a metal protective container. New items are available in several standard sizes; special sizes on request.—*George E. Fredericks Co., Bethayres, Penna.*

Please mention number 1212 when filling out card

Pulse Generator

New "Model P-55" pulse generator is a smaller, more economical model of maker's "P-54"; is completely self-con-

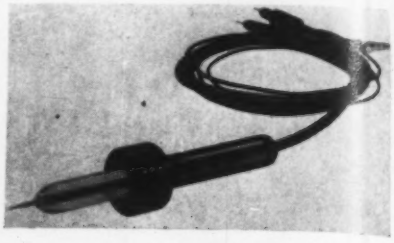


tained, obviating need for outside beat oscillator. Instrument provides rectangular pulses of variable frequency. Pulse width, 1.5 to 70 microseconds; repetition frequency, 60 cps. to 100 kc.; output impedance, 250 ohms; rise and fall times, 0.3 microsecond; polarity, both positive and negative simultaneously.—*Raymond M. Wilmotte, Inc., 1469 Church St., N. W., Washington 5, D. C.*

Please mention number 1213 when filling out card

TV Test Probes

New "Series TV" high voltage safety test probes afford direct measurement facilities up to 30,000 volts d.c., with



complete safety to the operator. Probes provide direct kilovoltmeter facilities with present high sensitivity test sets and vacuum tube voltmeters. Functional safety is provided via extended high dielectric anti-leakage paths; multi-channeled guard barrier; full handle length internal arc-back shield directly grounded; external arc-back barrier directly grounded; fully shielded instrument connecting cable further safeguards user; all critical high potential and ground connections within probe are positively accomplished via high compression contact springs; probe head is made of polystyrene; handle and barrier of "bakelite;" internal components, made of "lucite," are specially machined and tooled. — *Precision Apparatus Co., Inc., 92-27 Elmhurst, L. I. N. Y.*

Please mention number 1215 when filling out card

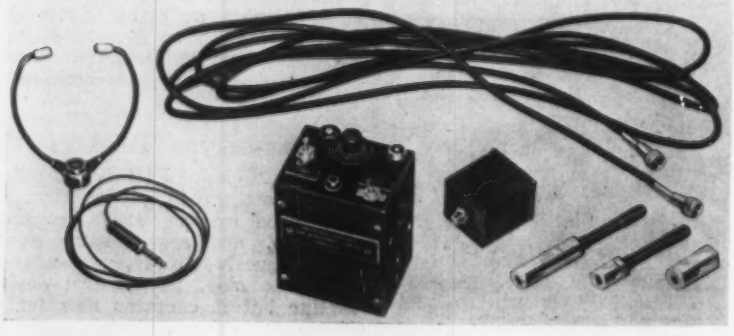
"Q-Gas" Geiger Counter

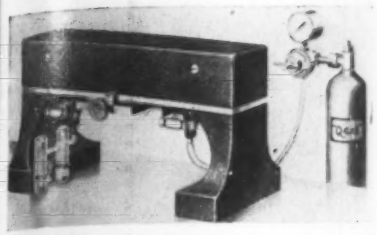
New Geiger counter, especially designed for efficient detection of soft ionizing radiation like that from C^{14} or S^{35}, uses "Q-Gas" which permits operation of counter at atmospheric pressure over wide temperature range, with anode potential of only 1450 volts. Pulse output operates scaling unit with input sensitivity of 0.25 volt. Because of high gas pressure (atmospheric), efficiency for gamma radiation is greater than that of low-pressure type counters. Hard beta emitters are also efficiently counted because counter detects particles emitted with energies

Knock Detector-amplifier

New "Knockophone" is a self-contained instrument for making aural knock determinations. Includes vibrator pick-up, cable, amplifier case and stethoscope-type earphones. Can be installed in three minutes; operates from dry cells. Amplifier is of three-stage subminiature type. Earphones effectively exclude road and vehicle noise. Knock intensity may be adjusted to any level. With filter off, total engine noise is heard, permitting engine analysis.—*Engineering Research and Development Co., P. O. Box 166, Hinsdale, Ill.*

Please mention number 1214 when filling out card





at low end of energy distribution curve. Discriminate counting can be done by use of absorbers in built-in shelf. Sample holder, 1" in diameter, is mounted on stainless steel slide, and accommodates sample trays up to ⅛" in height. Instrument is supplied with tank of "Q-Gas," regulators, 12 sample pans, and cable for connection to scaler.—*Nuclear Instrument and Chemical Corp., 223 W. Erie St., Chicago 10, Ill.*

Please mention number 1216 when filling out card

Control Station for Pneumatic Automatic-control Systems

New "Nullmatic M/P Control Station" is a miniature-panel control station for graphic panels, consoles, and standard panelboards. It is used with maker's remote-set-type "Nullmatic" Controller. It requires only 4⅛" × 4¾" of panel space, yet provides indication of process, control-point, and valve pressures, and includes transfer switches for "bumpless" manual-automatic changeover. Illustration shows new control station, which includes a "Nullmatic" pressure regulator and a new duplex indicator containing two Bourdon tubes. Black pointer always indicates process value; red pointer, which travels around periphery of dial, normally indicates control-point-setting

pressure. When a spring-return switch is thrown, this red pointer indicates pressure on diaphragm valve. Manual-automatic switch has a seal position which "locks in" existing control. When switch is in this position, operator can set valve pressure before he changes to manual, or he can set control-point pressure before he changes to automatic. In switching either way, he avoids any "bump" to process. Controller can be used for flow, liquid-level, temperature, etc. When remote-set-type control instrument is installed at the process, "M/P Controller" is especially suitable for difficult flow-control and other applications with short process lags.—*Moore Products Co., H & Lycoming Streets, Philadelphia 24, Pa.*

Please mention number 1218 when filling out card

Air-conditioning Control

New three-in-one instrument provides improved control of room temperature and humidity in paper, textile, tobacco and other plants in which specific atmospheric conditions affect quality and quantity of output. It is available in either pneumatic or electric types. Pneumatic model contains a series of flush-mounted pressure gages which instantly indicate any changes occurring during processing. Entire controlling and indicating mechanisms, including an aspirating fan, are housed in a locked cabinet to prevent unauthorized adjustments and tampering. An added feature is a system which protects measuring and controlling elements against lint and dust.—*Brown Instrument Co., 4482 Wayne Ave., Philadelphia 44, Pa.*

Please mention number 1219 when filling out card

Testing-machine Strain-rate Pacer

New strain rate pacer embodies self-synchronous generator in maker's "Microformer" recorder (right). Indicator (left) consists of pointer driven by motor controlled by transmitter, and coaxial dotted disk driven by synchronous motor at speeds determined by available gear mechanisms. Strain rates are held by synchronizing pointer and disk speeds. Distinguishing feature of new pacer is said to be greater accuracy and direct indication of rate of displacement between test specimen gage points, as compared with pacing rate of motion of testing machine crosshead.—*Baldwin Locomotive Works, Philadelphia 42, Pa.*

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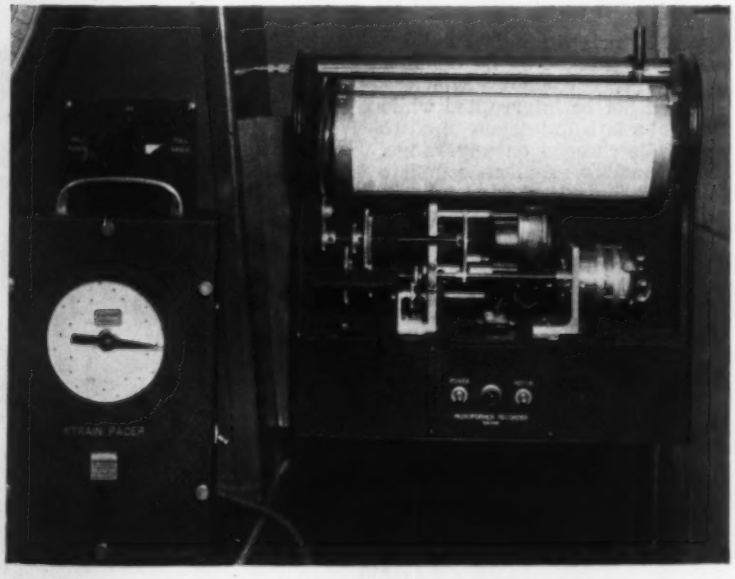


Voltage-dividing Variable Resistor

New high-precision 2" voltage-dividing resistor is designed to meet high standards demanded by computor and

military applications. Features are high degree of accuracy, special method of winding non-linear resistances, and linear windings to an accuracy of 0.2% of total resistance. Non-linear function may be made to conform to desired function with 1% of total resistance. Maximum electrical rotation is 320°. Unit is assembled in precision-machined aluminum base 2" in diameter and 1" deep. Other features include precision phosphor bronze bushing, centerless ground stainless steel shaft, no set screws, 360° mechanical rotation and basic design which permits use in ganged assemblies.—*Technology Instrument Corp., 1058 Main St., Waltham, Mass.*

Please mention number 1220 when filling out card

Dead-weight Thickness Caliper

New "Exact Micrometer" calipers thicknesses of sheet materials or other articles up to ½". Dead weight prin-

ciple employs devices to maintain uniform measuring pressure at all times,

M & G

DIAPHRAGM SEALS PROTECT

PRESSURE INSTRUMENTS from CORROSION & CLOGGING

PIPE MOUNTING ¼ to 1 ½ NPT connection—plain and cleanout type.

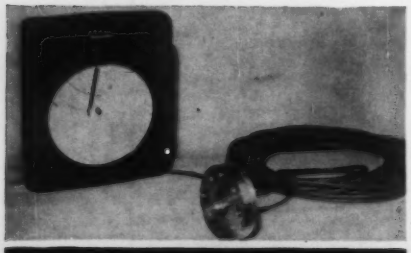
FLANGE TYPE for any size pipe flange connection

AVAILABLE in any machinable metal or material

STOCKED in common sizes and several materials

FACILITIES—gage stock and instrument calibration to ½ of 1%.

Write for Data Sheets



MANSFIELD & GREEN

1051 Power Avenue CLEVELAND 14, O.

at any point of anvil travel, whether article measured is thick or thin. Top lever lifts anvil; descends by gravity, a dash-pot action preventing too-rapid descent. Instrument is provided with zero adjusting devices, accessible from outside frame, permitting indicator to be set at exact zero on dial. Internally, mechanism is designed to prevent accidental change of zero adjustment. Dial is 6" diameter, clearly marked (thousandths or half-thousandths), glass covered, and located for convenient reading. — *E. J. Cady & Co., 134 N. LaSalle St., Chicago 2, Ill.*

Please mention number 1221 when filling out card

Ionization-type Vacuum Gage and Automatic Controller

New "DPA-37 Ionization Gage Control Circuit" features: (a) positive protection of ionization gage filament; (b) longer ion tube life through reducing grid current; (c) four scale ranges cover all pressures commonly met in high-vacuum work. Instrument is therefore recommended for both laboratory and production applications. When "DPA-37" is used in conjunction with "VG-1A" tube, it is capable of reading pressures from 5×10^{-7} mm. Hg to 2½

microns. A sensitivity of 50 microamperes per micron is obtained with an anode current of 2 ma. Anode current is automatically held at this point over a wide range of pressure and voltage fluctuations. Indicator with a 4½" scale is used to read both anode and ion current. It and ionization tube are protected against damage from high pressures by a manual-reset automatic cut-off relay. Power is brought from this protective circuit to an outlet on chassis for operation of an audible or visual signal or of automatic-control components. Sensitivity of amplifier may be quickly checked by means of a built-in calibrating voltage. Filament emission need not be interrupted while ionization tube is being degassed. Zero setting may be checked on any range. "DPA-37" can be supplied complete with "VG-1A" ionization gage tube in cabinet, for rack mounting (19" wide) or with recording potentiometer.—*Distillation Products, Inc., 755 Ridge Road West, Rochester 13, N. Y.*

Please mention number 1222 when filling out card

All-metal Geiger-Muller Tube

New "Thyrode" (RMA Type designation 1B85) is an aluminum beta-gamma counter tube designed to replace thin-walled glass tubes. It operates at 900 volts. Plateau length is not less than 200 volts; plateau slope does not exceed 3% per 100 volts. Nominal recovery time is 100 microsec. Minimum operating life is 10^8 counts with life test end point plateau 850 to 950 volts. Wall is 30 mg/cm² aluminum. Other features: (1) more nearly uniform and reproducible characteristics; (2) convenient plug-in base for practical water-tight probe or chassis mounting. (3) ribbed walls for greater mechanical strength. —*The Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, Ohio.*

Please mention number 1223 when filling out card

Multi-range High-current High-precision Current Transformer

Here is the correct illustration for the detailed description of a new precision eight-rating current transformer

which appeared in our October issue, page 921. This new product is made by the *Westinghouse Elec. Corp., Box 1017, Pittsburgh 30, Pa.*

Please mention number 1224 when filling out card

Portable Leak Detector

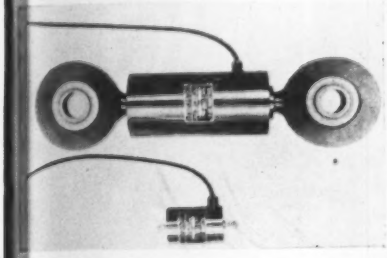
New "Type H" portable leak detector is especially designed for production testing of hermetically-sealed units as used in refrigerators, etc., in which

halogen compound is refrigerant; also tanks, boilers, piping, and other closed systems into which halogen compounds can be introduced as a tracer. It can detect a leak so small that it will release only 1/100th of an ounce of Freon in one year. It can inspect in a few seconds an ordinary joint or seam for leaks. It is suitable for service testing in the field as well as for assembly-line use. Detector unit weighs 3 lbs., contains a halogen-responsive sensitive element and a motor-driven blower. An 8-ft. cable lead connects detector unit to control unit. Control unit (weight 15 lbs.) contains power supply, amplifier, indicating instrument, necessary controls, and a carrying strap. A 25-ft. lead connects control unit to a-c. outlet. Provision is made on control unit for using earphones or a loundspeaker to indicate leaks, in which case indication will be an audible note with pitch depending upon size of leak.—*Special Products Div., General Electric Co., Schenectady 5, N. Y.*

Please mention number 1225 when filling out card

Tension-compression Tester

New "SR-4 Load Cell, Type U" measures both tension and compression loads. Pick-up elements are resistance wire

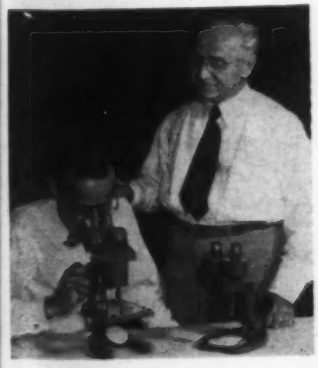


strain gages which are bonded to steel load-responsive member and hermetically sealed within rugged cylinder. Dimensions of this member change slightly under load, increasing or decreasing their electrical resistance. Applications include load weighing and general field of testing. Four load capacities are available from 500 to 50,000 lbs. — *Baldwin Locomotive Works, Philadelphia 42, Pa.*

Please mention number 1226 when filling out card

Wide-field Microscopes

Fifteen new wide-field microscopes are said to provide greater field of observation than ever before attained.



HIGH-SPEED RECORDING PROBLEMS SOLVED...

by Photoelectric Recorder..

Further proof that the G-E Photoelectric Recorder can record anything that can be measured is found in the Illinois Testing Laboratory, Inc. Their engineers say, "The G-E Photoelectric Recorder provides a versatile, sensitive recording unit for temperature, light, and electrical phenomena." As shown above they are using it to record very low air velocities measured by their thermo-anemometer, an instrument for air circulation tests.

The extreme sensitivity and high-speed response of the photoelectric recorder make it ideally suited to this application, as well as for thermocouple response tests and resistance thermometry. It gives a complete recorded history of these operations.

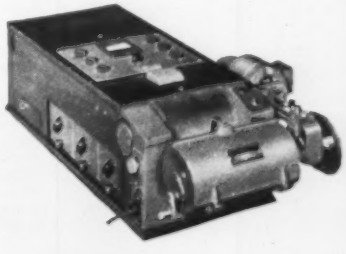
The Illinois Testing Laboratory, Inc. is just one of the many users who have found the G-E Photoelectric Recorder useful in solving their recording problems. There are many other applications embracing the entire field of measurements, since the recorder can *record* anything that can be *measured*.

A wide range of sensitivities (which go as low as 1.0 microamperes for full scale deflection) and response speeds as high as 1/4 second are available in the photoelectric recorder. Basic elements are interchangeable so that one instrument can cover a number of ranges. It is also available as a potentiometer recorder. Write for Bulletin GEA-2394, or contact your nearest G-E sales office and let us help you with your application problems.

PM-10 OSCILLOGRAPH

Increase the scope of your investigations, design, and testing of many types of machines and devices. The General Electric PM-10 Oscillograph provides a permanent record of—

Voltage	Speed	Strain
Current	Pressure	Sound
Time	Stress	Vibrations



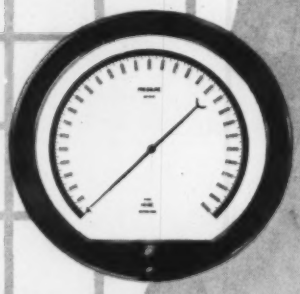
This oscillograph includes simultaneous viewing with recording, which permits traces to be shown continuously on the viewing screen. Wave shapes or deflection can be observed, as well as the arrangement of waves.

Benefit from the extreme sensitivity and versatility of this instrument. Write for Bulletin GEA-3662 today. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

602-118

a bourdon tube of special design for every application



HEISE GAUGES

STANDARD OF THE WORLD

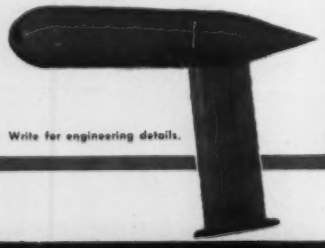
Heise pressure gauges employ an infinite number of Bourdon tube designs to reduce fibre stress to a point where the gauge can be used continuously at maximum calibration. There is no standard design. Every Heise Bourdon tube is designed for maximum stability and accuracy in a selected range and pressure medium.

Three sizes: 8½ in., 12 in., and 16 in., in ranges from 0-15 to 0-10,000 psi. Prices from $151.60 to $211.20. Write for catalog.

Heise Bourdon Tube Company, Inc.
Newtown, Connecticut

Ambient
AIR TEMPERATURE PROBE
Provides Greater Accuracy
With Simpler Calculations

At velocities above 300 MPH, the Giannini Temperature Probe simplifies data reduction by measuring *total* air temperature. All the velocity energy is converted to temperature. No need to correct for partial adiabatic rise. Simplified calculations, less flight-time, and greater accuracy are the major factors contributed by this Giannini instrument for flight-test purposes.



Write for engineering details.

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REACTION POWER PLANTS • AUTOMATIC FLIGHT EQUIPMENT
1505 WEST COLORADO STREET • PASADENA 1, CALIFORNIA

High precision OPTICAL PARTS for Research, Development or Production.

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PARABOLIC or SPHERICAL Mirrors.

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LENSES, PRISMS or related components for your visual, photographic or electronic requirements.

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Natural or Synthetic CRYSTAL OPTICS
Lithium fluoride, sodium chloride, potassium bromide. Fused or natural quartz elements.

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Vacuum Coating of Optical Parts.

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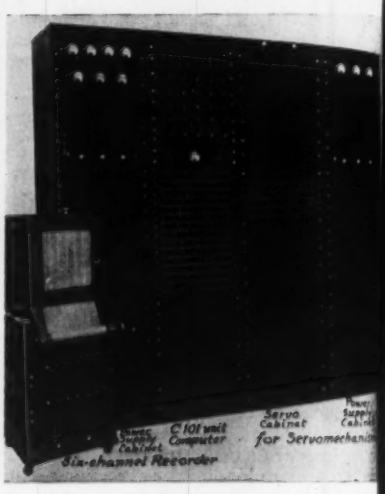
Models can be interchanged into different combinations for medical research, industrial and educational purposes. Optical systems are completely sealed to exclude dust. Dissecting microscopes are now available with extra-large stage and base, while an elaborate instrument is offered to industry for use in surface examination (up to 5 ft. diameter). Objectives minimize image deterioration at edge of field of view, while eyepieces provide higher eye-point for greater comfort, and prevent interference with eyeglasses. Dust-proof, sliding nosepiece on three-objective models offers rapid, convenient means of interchanging objectives. Four positions are provided for new illuminator and fluorescent lamp. Microscopes are equipped with diffusing disks of black and white that provide background contrast.—*Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.*

Please mention number 1227 when filling out card

High-speed Electronic Computer

New "REAC" (Reeves Electronic Analog Computer) was originally developed for Special Devices Center, Office of Naval Research, has just been released from Navy's list of classified material. It is said to meet need for reasonably-priced high-speed electronic differential analyzer in chemical research and automatic process control and to make possible mathematical explorations into fields of scientific analysis hitherto economically unfeasible. It serves as a high-speed computer, as a simulator, or as a tester. As a computer it rapidly provides accurate dynamic solutions of simultaneous differential equations. As a simulator it may be used to design automatic control equipment for continuous processes: allowable ranges of design parameters may be quickly and accurately determined eliminating trial-and-error methods. As a tester it may simulate a continuous manufacturing process so that automatic controllers may be tested to determine their performance in the actual process. It will solve "with a high degree of accuracy" any initial valued differential equation up to the seventh order. Two or more "REACs" may be interconnected to handle problems of higher order. A servomechanisms unit may be added to increase scope, to provide for vector resolution and vector addition

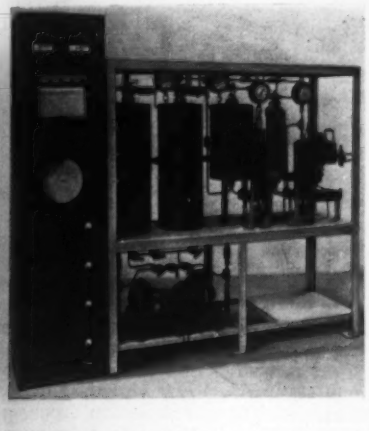


It will also multiply and divide arbitrary functions made possible by special functional voltage-dividing resistors. "REAC" proper is an all-electronic computer consisting of twenty amplifiers for summing and integrating. Initial conditions and problem variables are set in on vernier dials that are connected to precision voltage dividers. The problem is "set up" by means of telephone-type patch cords that inter-connect the various amplifier inputs and outputs. Final solution is recorded on a six channel recorder. Operation of computer is said to be simple. An engineer or mathematician can learn "in a short time" how to set up and solve most types of problems. Maintenance is minimized by use of standard high-precision radio parts.—*Reeves Instrument Corp., 215 E. 91st St., New York 28, N. Y.*

Please mention number 1228 when filling out card

Laboratory Hydrogenation Unit

New hydrogenation research unit consists essentially of two high-pressure high-temperature reactors, one high-temperature separator, one low-temper-



ature separator, two preheaters, also feed pumps, valves and fittings, furnace and temperatures to 1000°F. Instruments and control equipment consist of a pressure recorder and controller, multiple-point temperature recorder, two furnace temperature indicators and controllers, and six variable transformers for adjusting current to furnaces and preheaters. System pressure is kept constant regardless of gas or liquid feed rates.—*Autoclave Engineers, Inc., 860 E. 19th St., Erie, Pa.*

Please mention number 1229 when filling out card

Magnification Checker

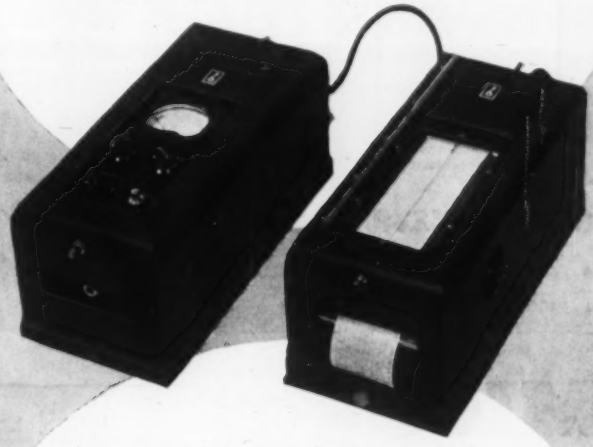
New "ESD" magnification checking device provides means for checking mirror adjustment and lens magnification of optical comparators and projectors. Steel balls and pins of the checker are

Would

INSTANTANEOUS

recording of electrical phenomena from D. C. to 100 c. p. s. help in your research?

It's a fact — permanent, instantaneous ink-on-paper recordings by Brush Oscillographs make their use almost unlimited!



Accurate recordings of voltages, pressures, radiation intensity and countless other phenomena can be made over a frequency range of D.C. to 100 c.p.s. Either A.C. or D.C. signals can be measured. Whenever desired, recordings may be stopped for notations on chart-paper.

Investigate *Brush* measuring devices before you buy . . . they offer more for your money. Why not have a Brush representative call? At no obligation, of course.

Just call or write — today — you'll find it worth a few seconds' time!

THE Brush DEVELOPMENT CO.

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COUNT TEN TIMES FASTER ...and accurately!

MODEL 310
ILLUSTRATED
PRICE $185.00

The new Photo-electronic Counter was designed for industrial applications in which mechanical counters do not count accurately or wear rapidly because of counting speed. One of the well-known Potter electronic counter decades is used to scale down the operating speed of a reliable electro-mechanical register. In the Model 310, the photo-electric "eye" is located inside the cabinet and the light enters through a small window at the rear. In the Model 312, the photo-electric "eye" is housed separately for remote counting. Small objects as well as closely spaced parts can be accurately counted since the width of the photo-electric beam is only ¼ inch, and does not require complete interruption for actuation. Another version, the Model 311, uses an electromagnetic pick-up coil for counting shaft rotation without contact.

For complete literature or consultation on high speed counting, timing and control problems call or write Dept. 3H.

NEW POTTER
PHOTO-ELECTRONIC COUNTER

- ★ High speed—counts at rates up to 6000 per minute
- ★ Long life—mechanical register operates at only 1/10 normal rate
- ★ Direct reading—units digit is read from electronic counter, other digits from mechanical counter
- ★ Accurate—mechanical register not affected by detector "on-off" time
- ★ Compact — completely self-contained, no wiring required, easy to install
- ★ Flexible—self-contained "eye", separate "eye" or electromagnetic pick-up coil may be used for actuation

POTTER INSTRUMENT COMPANY
INCORPORATED
136-56 ROOSEVELT AVENUE · FLUSHING · NEW YORK

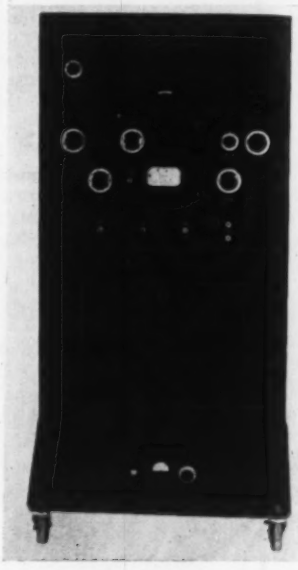
INSTRUMENT Potter COMPANY

held to diameter accuracy of 0.000[illegible]. Balls are suspended by spring-[illegible] pins in openings of machined alum[illegible] bar. Device checks both horizontal [illegible] vertical magnifications and is us[illegible] with all comparator screen sizes. F[illegible] nished with four precision-ground h[illegible] — *Engineering Specialties Div., Buffalo 8, N. Y.*

Please mention number 1230 when filling out ca[illegible]

Television Signal Generator

New "Model 90" television stand[illegible] signal generator is said to be first c[illegible] mercial wide-band, wide-range, stand[illegible]

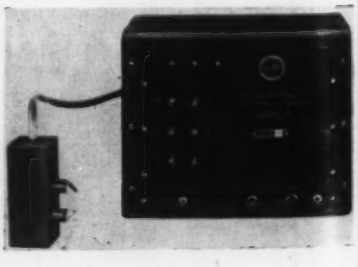


signal generator. It has master os[illegible] lator, buffer-amplifier and modulat[illegible] power amplifier; output circuits are [illegible] double-tuned, over-coupled, band-pa[illegible] type, permitting modulation frequenc[illegible] up to 5 Mc., and excellent isolation [illegible] obtained between final amplifier a[illegible] oscillator, thus eliminating incident[illegible] frequency modulation. Carrier range [illegible] continuously variable from 20 to 2[illegible] Mc. in eight coil ranges. Frequen[illegible] scales are individually calibrated. [illegible] self-contained crystal calibrator permi[illegible] setting of even megacycle carrier f[illegible] quencies to 0.01% or better, setti[illegible] accuracy of direct reading frequen[illegible] dial is 0.1%. — *Measurements Cor[illegible] Boonton, N. J.*

Please mention number 1231 when filling out card

Photoelectric Counter

New "Model 700" predetermin[illegible] photoelectric counter specifically f[illegible] use on folding box machines, will pr[illegible] determine count of either 25 or 50 [illegible]



—MICO—
2 & 3-DIMENSIONAL ENGRAVER

Permits accurate reproduction of three-dimensional master on any of four reduction ratios.

Catalogue on request

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CAMBRIDGE, MASS.

The best ANSWER

For the past three years, we have been advising you that our "Full-View" rotameter with Safety Shielding gives these advantages for flow rate measurement: (1) lower maintenance, (2) greater safety, (3) increased corrosion resistance, and (4) higher accuracy. To date several hundred companies have found that they like our product and our way of doing business. This is the best answer we can give you to establish the validity of these claims for our rotameter. Maybe you, too, would get better performance with it. We make all types of indicating and recording - controlling rotameters. As a starter, why not send for our Bulletin #20 which goes into details?

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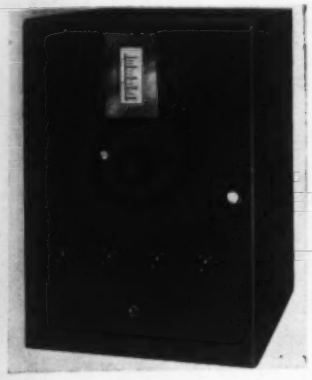
Box A-51248 Lansdale, Pa.

…es up to 9000 cartons per minute. …ch time selected number of cartons …sses detector, counter energizes kick-…type solenoid thereby displacing 25th …50th carton as required. — *Potter …strument Co., Inc., 136-56 Roosevelt …ve., Flushing, N. Y.*

Please mention number 1232 when filling out card

Pressure Indicator

New "Atcotran" 3-channel pressure …dicator incorporates a 72" scale, said …be longest available. It accommodates …y one or any group of maker's "Atco-…ran" pressure measuring cells, such as …Bourdon tube, bellows, or differential

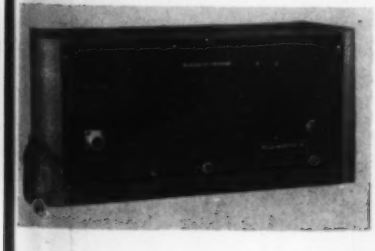


…llows for flow. Three bands (selector …witches on front of case) may be cali-…rated either linearly for any range …quired or in square-root scale for flow, …c. Each scale is 72" in length and …oves full range in less than two sec-…nds. Dead-beat response with 5,000 …ositive motor-driven positions is fea-…re. Accuracy is within 0.25% of read-…g (not total scale range). Zero ad-…stment is accomplished with screw on …ront of case. Because this indicator is …null balance instrument, zero check-…g is simplified. Selector switches up …maximum of 40 can be mounted on …ront of indicator case. Several meas-…rements may be either added, sub-…acted or divided. — *Automatic Tem-…rature Control Co., Inc., 5212 Pulaski …ve., Philadelphia 44, Pa.*

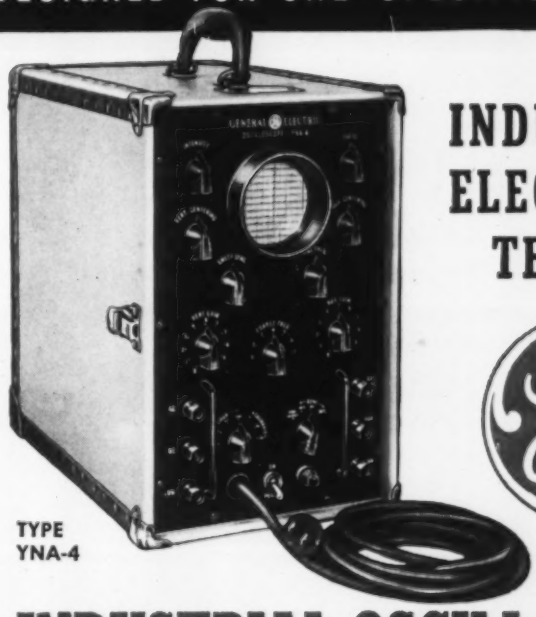
Please mention number 1233 when filling out card

Television Testing Oscillator

New "Mega-Marker Sr." oscillator …w has tone modulation for television …sting. This addition permits aural …entification of output in receiver loud-…peaker. Modulation may be switched …n or off. By its use, local oscillator …ay be aligned by using only "Mega-…arker Sr.," television sound channel …nd loud speaker. Instrument is a



DESIGNED FOR ONE SPECIFIC PURPOSE—



TYPE YNA-4

INDUSTRIAL ELECTRONIC TESTING

GE

INDUSTRIAL OSCILLOSCOPE

Check—Measure—Test—with the G-E Industrial Oscilloscope.

The following partial list of uses will indicate its importance where ever electrical apparatus is employed.

For checking welding equipment, testing photo-electric circuits, checking performance of relay contacts, performance of high power rectifier tubes, measuring voltage and current relationship in motors, performance of commutators, checking audio oscillators—the YNA-4 Industrial Oscilloscope performs all these important checking and testing functions most efficiently.

D-C Amplifiers for Horizontal and Vertical Deflection—Give a true trace combining both the AC and DC components important for industrial purposes which is not possible with the ordinary oscilloscope used in radio work.

Completely Insulated Case—Since the entire unit is insulated, it may be operated as high as 550 volts above ground. Instrument may be placed on metal working surfaces, machinery, and other advantageous working spots even when connected to ungrounded circuits.

Internal Calibrating Voltages—The YNA-4 provides internal calibrating voltages of known value to enable the operator to set the deflection sensitivity of the oscilloscope. Functions as a vacuum tube voltmeter permitting AC and DC voltage measurements without a voltmeter.

Flexible Input Circuits—Vertical Amplifier—varied inputs are available to accommodate a wide range of voltages and circuit requirements. This oscilloscope may be used to examine voltages from 1.0 volt to 500 volts and its input impedance may be switched from 1 megohm to 10 megohms or to open grid.

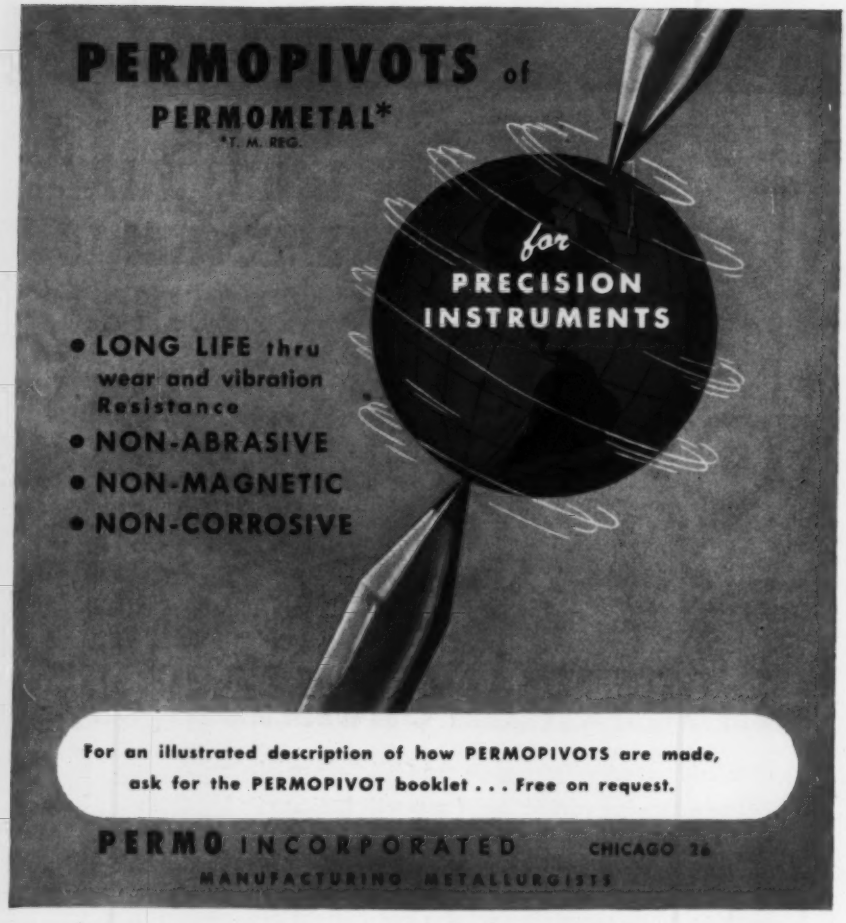
Horizontal Amplifier—direct coupled input terminals are provided or the built-in sweep generator may be used for horizontal deflection. This generator may be synchronized with the power line, the vertical amplifier or with an external source.

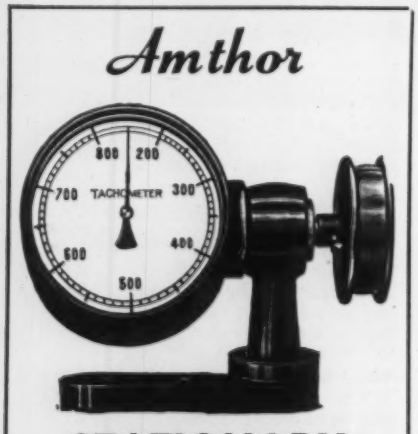
Wide Sweep Frequency Range—The YNA-4 has been designed so that the operator can observe separate cycles over a wide band of frequencies. A minimum sweep rate of 10 cycles has been established as desirable for industrial operations—this has been incorporated in YNA-4.

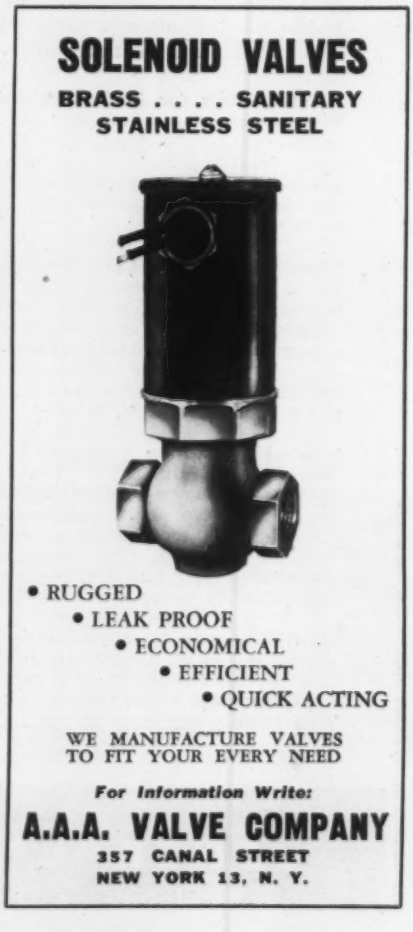
For complete information on the YNA-4 Industrial Oscilloscope and other precision measuring equipments write today to: *General Electric Company, Electronics Park, Syracuse, New York.*

165-G6

GENERAL GE ELECTRIC







twelve channel single dial switched crystal controlled oscillator. Crystal accuracy is 0.01%.—*Kay Electric Co., Maple Ave., Pine Brook, N. J.*

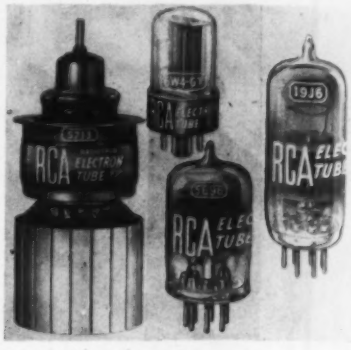
Please mention number 1234 when filling out card

Industrial Electron Tubes

Four new industrial tubes added to maker's line are:

1. New "Type 5713" power triode tube of forced-air cooled radiator type is for use in grounded-grid circuits particularly of line-transmission type. Maximum plate dissipation is 250 watts. tube operates at frequencies up to 22 Mc.

2. New "Type 6W4-GT" half-wave vacuum rectifier tube of heater cathode type is for use as damper diode in tele-



vision receiver circuits. Withstands peak inverse plate voltage of 2,000 volts and plate current of 600 ma.; output voltage is about 350 volts at full load current of 250 ma.

3. New "Type 5696" thyratron tube is of miniature, tetrode type for relay applications such as counter circuits. Features include steep control characteristics independent of ambient temperatures from −35 to +90°C.; insensitivity to line fluctuations; high circuit sensitivity.

4. New "Type 19J6" half-mu twin triode miniature tube is for converter service in a-c., d-c., AM-FM receivers also for oscillators, amplifiers and mixers in television receivers. Has 18.9 volt 0.15 ampere heater; can be operated with other tubes having similar heaters. —*Radio Corp. of America, Harrison, N. J.*

Please mention number 1235 when filling out card

Reflected-energy Meter

New model "Mega-Match" displays reflected energy from antenna or termination simultaneously over band

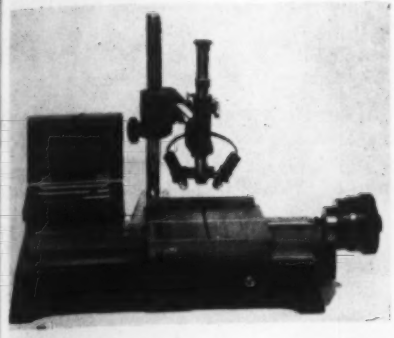
mc. wide anywhere between 10 and 2 mc. A modified model, by use of special coaxial detector and high quality delay line, displays reflected energy in ba

widths of 30 mc. anywhere between 10 and 500 mc. — *Kay Electric Company, Pine Brook, N. J.*

Please mention number 1236 when filling out card

Measuring Microscope

New measuring microscope for use in mold shop and toolroom has a range nominally 10". Objects up to 7" high are accepted under microscope objective. Micrometer head is provided with

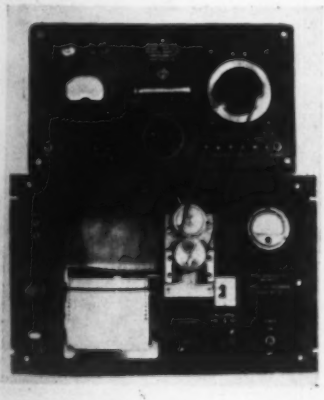


scale on barrel which can be tilted to correct for any lead screw error. Accordingly any residual lead error of this screw is exactly cancelled. Instrument is built to accept large and heavy workpieces for measurement. Measurement can be made in a minute while extended range measurements may take two minutes or more. 32X magnification. Higher-powered objectives and eyepieces can be added. Base is stress relieved and pre-aged "Meehanite." Gage rods are hardened, ground, carbide tipped and lapped to a tolerance of 0.000025". Stage moves on precision ball bearings, and is provided with V channels for convenient measurement of screws, taps, diameters, of small parts, etc.—*Boeckeler Instrument Co., 31 East Rillito St., Tucson, Ariz.*

Please mention number 1237 when filling out card

Recording Sound Analyzer

New "Model FR" and "Model FR-1" records frequency analysis of complex waves from 25 to 7500 cps. on a 4" wide calibrated scale, when employed in conjunction with General Radio 760-A



Sound Analyzer. Permanent ink record is made on frequency-calibrated longitudinal scale. Full scale width is calibrated linearly in equal 20, 40, 60, or 80 db. divisions. Mechanical link unit

This beats a magic carpet!

Air Express can bring you supplies and equipment from any U.S. point—*overnight*. And that's better than old-style magic! Air Express is the fastest way you can find to ship or receive. No delays, because shipments go on every flight of the Scheduled Airlines.

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- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost.
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True case history: Rubber equipment users regularly get replacement parts by Air Express so machines won't stand idle. Recent shipment: 102-lb. carton picked up 5 P.M. the 18th in Noblesville, Ind. Air-rail to Dallas, delivered 9 A.M. following day. 799 miles, total cost only $26.78. Any distance inexpensive, too. Phone local Air Express Division, Railway Express Agency, for fast shipping action.

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For further information on the only precision potentiometers that offer a service life of over 1,000,000 cycles with *sustained* accuracy address: Dept. J, 88-06 Van Wyck Boulevard, Jamaica 1, New York.

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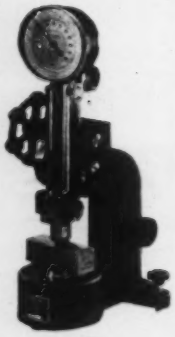


Illustrated bulletins free

The Shore Instrument & Mfg. Co., Inc.

9025 Van Wyck Ave., Jamaica 2, N. Y.

HERE'S REAL NEWS

A NEW *High Power, Lighter Weight* PORTABLE POWER UNIT

For high power from a small unit, the new Burgess A. M. Power Units are *unexcelled!* Single cell units scarcely larger than an ordinary flashlight cell deliver currents as high as 100 amperes. at approximately 1.4 volts!

New Burgess A.M. Power Unit

A. M. Units are packed dry and activated with water . . . once activated they may be efficiently discharged at temperatures as low as −60°F. and as high as +150°F.! Write Dept. AM for full information on standard and special types.

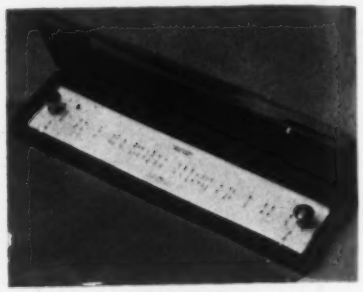
BURGESS BATTERY COMPANY FREEPORT, ILLINOIS

automatically drives frequency-sweep dial of analyzer in register with calibrated chart movement. Full frequency spectrum from 25 to 7500 cps. can be recorded in matter of seconds. Any specific range in this frequency band can be recorded by adjustable limit switches on coupling device. Especially useful for rapid and exacting analyses and studies of complex sounds, vibrations and other complex voltages, eliminating point-by-point plotting. Recorder is separately usable as a sound, power, or voltage level recorder.—*Sound Apparatus Co., 233 Broadway, New York 7, N. Y.*

Please mention number 1238 when filling out card

Magnification Checking Scale

New scale is for use with maker's "ESD" magnification checker. Rulings on under side of plate glass are straight

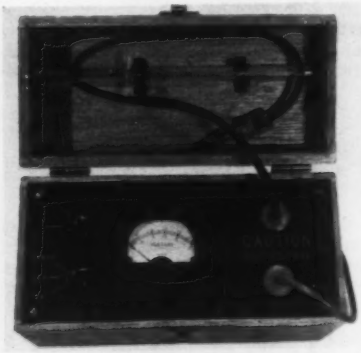


lines for pin of checker and arc segments for balls. Rulings are located exactly for various magnifications from 10X to 62.5X. Scale is 14¼" × 2¾".—*Engineering Specialties Div., 980 Ellicott St., Buffalo 8, N. Y.*

Please mention number 1239 when filling out card

Multi-range Kilovoltmeters

New "Series 121" multi-range kilovoltmeters, with full-scale ranges of 15/30 and 25/50 kv, at 50,000 and 25,000 ohms per volt, complement maker's "Series 101" single range kilovoltmeters, and are similar in basic operation.



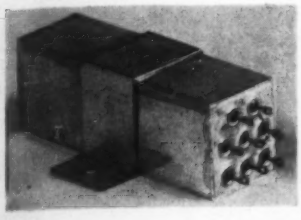
Input resistance is constant on both ranges, giving sensitivity of approximately 50,000 ohms per volt on lower voltage range and 25,000 ohms per volt on higher voltage range. Movement is 20 ma. full-scale, and is shunted by proper resistors. "Lucite" safety handle is provided to permit connection of voltmeter to source of high voltage without necessity of turning high-voltage power supply on and off. High-

voltage leads are permanently connected to voltmeter, "hot" end being embedded deeply in wax. No high voltage appears at any place on voltmeter panel. Range switching is accomplished at low voltage end of circuit. Voltmeters are particularly useful in television work to measure output of second anode high voltage power supply.—*Beta Electronics Co., 1762 Third Ave., New York 29, N. Y.*

Please mention number 1240 when filling out card

Ultra-high-speed Relay

New "Millisec" relay, formerly offered 3-p. d-t. is now made 4-pole, d-t. hermetically sealed. Relay will operate as



fast as ⅛ millisecond, has life expectancy of 22-100 million operations, and contact rating of 110 volts, d.c., ½ ampere. Because it is lightweight, compact (1" × 1" × 2½") and hermetically sealed, it is particularly useful for high-speed keying in aircraft or on shipboard, also in high-speed computers, business machines, high-speed commutators.—*Stevens-Arnold, Inc., 22 Elkins St., South Boston 27, Mass.*

Please mention number 1241 when filling out card

Binary Scaler

New "Model 4SN1A1" binary scaler for use in counting electrical impulses at speeds up to 200 kc., in either binary or decade operation, is designed for use in nucleonic and computer applications. Scaler provides scale of two in compact, self-contained, plug-in unit that keeps installation and maintenance at minimum. Unit permits flexible installation for such applications as industrial counting, interval timing, and repeat cycling. A 5-20-volt negative input pulse of one microsecond duration

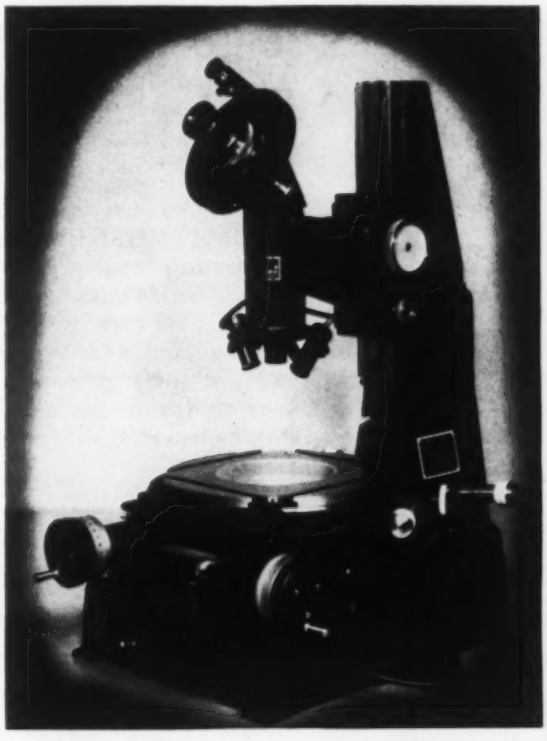
and 0.1 minimum rise time produces output pulse of 50 volts, peak to peak. 50-volt signal has rise time of 0.1 microsecond, which is sufficient to trigger succeeding binary unit without intermediate amplifier stages. Unit has resolution time of 5 microseconds, and output impedance of 27,000 ohms. It fits standard octal socket, and a single conductor carries signal from one scaler to next. Decade operation is accomplished with four units. Maximum load for unit is 200 $\mu\mu$f. in series with 75,000 ohms at pin four, or 50 $\mu\mu$f. in series with 100,000 ohms with decade indicating system at fourth binary, pin four. Any number of units may be zeroed by

Gaertner

TOOLMAKER MICROSCOPE

with

ROTARY STAGE



Especially useful for checking gear tooth spacings, laying out cam contours, and in performing numerous other precision measurements in either rectangular or polar coordinates.

Stage Rotation	360°
Direct reading to	1 minute
Coordinate Range	4 x 2 inches
Direct reading to	0.0001 inch

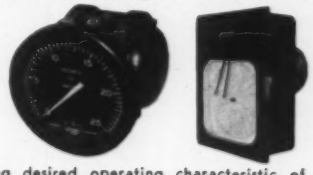
Write for Bulletin 147-14

THE GAERTNER SCIENTIFIC CORP.
1211 WRIGHTWOOD AVE., CHICAGO 14, U. S. A.

TWO SMASH HITS!

The NEW Barton Indicating and Recording Flow Meters

MODEL 200
DIFFERENTIAL PRESSURE INDICATOR



MODEL 202
DIFFERENTIAL PRESSURE RECORDER

For the first time, a long desired operating characteristic of the actuating element in flow meters has been achieved by Barton Instrument Company.

Stainless Steel Rupture-Proof Bellows • Torque Tube Drive • Self Venting or Draining Actuating Unit • Removable Pressure Chambers • Differential Range: 0-20 W.C. to 0-300 W.C.

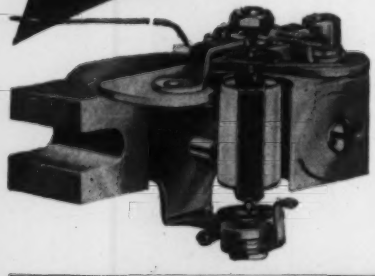
Write for Preliminary Data Sheets 200-1 and 202-1

BARTON INSTRUMENT CO.
3502 UNION PACIFIC AVE., LOS ANGLES 23, CALIF.

ONE OF A SERIES

UNIFORM DAMPING

WHY BURLINGTON PANEL INSTRUMENTS PROVIDE UTMOST RELIABILITY . . .



MAGNETIC SHUNT as used by Burlington insures uniform damping characteristics. All ranges AC and DC available in 2½", 3½", 4½" rectangular or round case styles and are fully guaranteed for one year against defects in workmanship or material. Refer inquiries to Dept. H128.

Burlington INSTRUMENT COMPANY
BURLINGTON, IOWA

Elementary Engineering Electronics

With Special Reference to Measurement and Control

By ANDREW W. KRAMER

Managing Editor *Power Plant Engineering*, member American Institute of Electrical Engineers, Associate Member Institute of Radio Engineers.

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DON'T PICK. USE SELF-STARTER STRIP TO PEEL LABELS.
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2 APPLY
3 IDENTIFY
LIKEWISE ON FLAT SURFACES
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QUIK-LABELS code wires, leads, circuits, relays, parts, etc. faster and at lowest buy-and-apply cost. Pre-cut to exact size, QUIK-LABELS come on handy cards, stick without moistening. Replace slow and costly string tags, roll tapes, decals, metal tags, etc. Silicone plastic coated to resist dirt, grease, moisture and abrasion. Exclusive Starter-Strip automatically releases any or all labels; it is faster, safer, snag-proof. Over 700 NEMA and ASA markings and colors in stock. Maintenance men carry cards to the job. QUIK-LABEL Dispenser holds cards for production operators and leaves both hands free for faster work. QUIK-LABELS are sold by distributors in over 125 principal cities of USA and Canada. Write for useful literature and FREE sample cards.

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Factory—Chippewa Falls, Wisconsin

single push button. Power supply specified is 210 volts d.c. ±20% at 7 ma, filament 6.3 volts at 0.3 amperes.—*General Electric Co., Schenectady, N.Y.*

Please mention number 1242 when filling out card

Cubicles

New line of cubicles designed to contain any and all types of control, recording and indicating instruments are

fabricated of 10-gage steel, to serve as protective housings, and are equipped with hinged access doors in rear. "Type No. 1" is individual cubicle which can be bolted with others. "Type No. 2" consists of specified number of cubicles welded together, but with divided front simulating individual sections. Cubicles can be fabricated with vapor-sealed doors and seams welded gas-tight. Available in widths of 18 to 36"; in depths of 12 to 21"; and heights of 72 to 96".—*K & H Industrial Products, Inc., Dept. 24, 459 Morgan Ave., Akron 11, Ohio.*

Please mention number 1243 when filling out card

Smoke Tester

New hand-operated "True-spot" smoke tester is primarily for use in checking oil burners for clean firing. Smoke test is made by locking paper

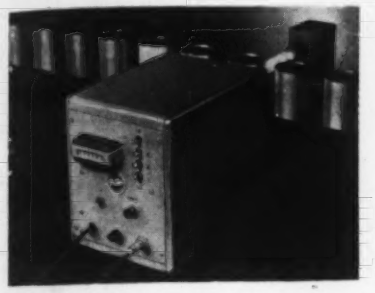
test disk into instrument, inserting metal probe into suitable hole in smoke pipe, and drawing with six pump strokes a sample of combustion gases from furnace flue. Disk turns light to dark gray depending on smokiness of flame

Soot content is measured by comparing discoloration with nine shadings on scale supplied with instrument. Scale tells limits of permissible smoke for various burners and types of heating systems.—*Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8, Pa.*

Please mention number 1244 when filling out card

High-speed Photoelectric Counter

New "Model 310" counter is for industrial applications in which mechanical counters do not count accurately,

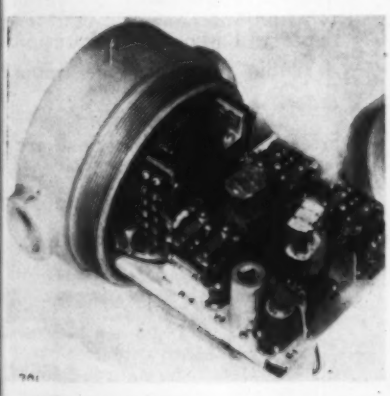


or wear rapidly because of counting speed. It is completely self-contained including photoelectric detector, electronic decade and six-digit electromechanical register. Counting speed of mechanical counter is scaled down by factor of 10, thereby increasing reliability and accuracy at counting rates up to 6,000 per minute. Last digit of number is registered on neon glow lamps of counter decade and other digits are indicated on mechanical register, providing maximum registration of seven digits. Small objects as well as closely-spaced parts can be accurately counted since beam width is ¼"; it responds to light changes as small as 25%.—*Potter Instrument Co. Inc., 136-56 Roosevelt Ave., Flushing, N. Y.*

Please mention number 1245 when filling out card

Motor-control System

New "Flexitrol" Electronic Load Control, for use with motor-operated processes, maintains a constant motor load



by regulating the input feed. Variable time delays and a variable dead zone are incorporated to eliminate hunting and to insure operation at maximum output. Model illustrated is available in either explosion-proof or standard sheet metal housings; suitable for motors of all ratings. It employs two identical ra-

Laboratory Standards

U. H. F. STANDARD SIGNAL GENERATOR *MODEL 84*

SPECIFICATIONS

CARRIER FREQUENCY: 300 to 1000 megacycles.

OUTPUT VOLTAGE: 0.1 to 100,000 microvolts.

OUTPUT IMPEDANCE: 50 ohms.

MODULATION: SINEWAVE: 0—30%, 400, 1000 or 2500 cycles. PULSE: Repetition—60 to 100,000 cycles. Width—1 to 50 microseconds. Delay—0 to 50 microseconds. Sync. input—amplifier and control. Sync. output—either polarity.

DIMENSIONS: Width 26", Height 12", Depth 10".

WEIGHT: 125 pounds including external line voltage regulator.

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Solving New Battery Problems is a **BURGESS SPECIALTY**

No. 4FH. Delivers 1½ volts for popular industrial applications.

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RAWSON Thermocouple Meters

No Wave Form Errors—R.M.S. Readings ½ of 1% Accuracy

SINGLE RANGES from 1 ma full scale to 10 amperes full scale. Good from DC to 2 megacycles and higher.

MULTIPLE RANGE INSTRUMENTS with selector switches. Any practical combination of voltage or current ranges furnished to order.

Example 1.5-5-15-50-150-1500 volts at 1000 ohms per volt, DC to 10 KC.

RAWSON THERMAL MULTIMETERS

Ranges on one meter—10 ma to 3 amps, 300 mv to 1000 volts.

Write for Bulletin 502

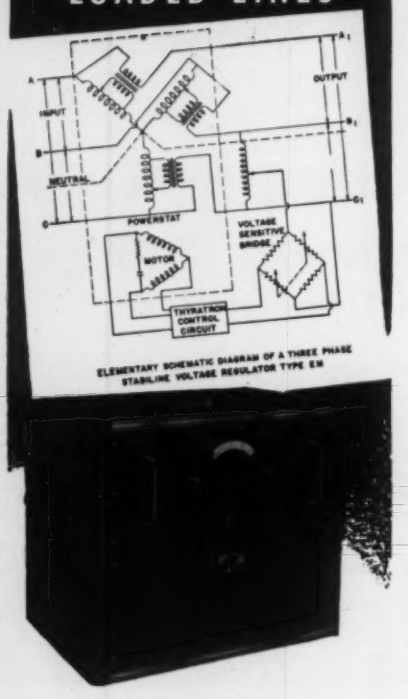
RAWSON ELECTRICAL INSTRUMENT COMPANY

112 Potter Street Cambridge, Mass.

Representatives

Chicago Los Angeles New York City

MAINTAIN
CONSTANT
VOLTAGE ON HEAVILY
LOADED LINES



ELEMENTARY SCHEMATIC DIAGRAM OF A THREE PHASE STABILINE VOLTAGE REGULATOR TYPE EM

USE STABILINE ELECTROMECHANICAL VOLTAGE REGULATORS

In the plant — as in the laboratory — constant voltage is a necessity. It can be maintained to large industrial loads by using STABILINE (Electromechanical) Automatic Voltage Regulators.

These units feature zero waveform distortion; complete insensitivity to magnitude and power factor of load; no effect on system power factor; no critical adjustments; high efficiency; adjustable output voltage. Available for a wide range of applications in 115, 208, 230, 440 volt, single and three phase ratings; capacities to 100 KVA.

Write Today for Full Details

THE SUPERIOR ELECTRIC COMPANY
712 MEADOW STREET
BRISTOL, CONN.

dio type vacuum tubes and operates from 115 volts, 60 cycles.—*G. C. Wilson & Co., 2 N. Passaic Ave., Chatham, N. J.*

Please mention number 1246 when filling out card

Laboratory Shakers

New line of laboratory shakers offers choice of three types of utensil carriers and four types of agitation speeds. Utility box carrier, 18″ × 12″ × 4″, is furnished with rubber-coated sliding bar clamps that hold objects of various sizes and shapes securely. Two flask carriers available accommodate 15 250-ml. and 12 500-ml. flasks. Single speed models agitate solutions, etc. at 160 or 280 oscillations per minute while a double speed model offers both 180 and 280 speeds. Variable-speed model with rheostat provides any speed from 100 to

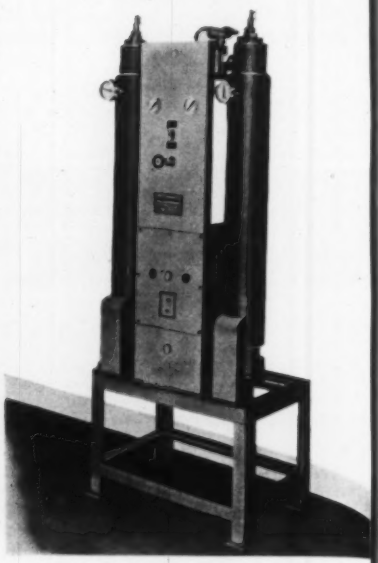
300 excursions per minute. Motion of 1½″ is provided by v-belt drive from ¼-hp. motor for single and double speed shakers, and 116-hp. motor on variable speed unit. Bases are 16½″ × 11½″ × 9½″, and are equipped with suction cup feet and have noise-deadening coatings. —*Eberbach & Son Co., Ann Arbor, Mich.*

Please mention number 1247 when filling out card

Coal-furnace Air-jet Control

New automatic over-fire air jet control provides means of indicating and correcting objectionable smoke density from coal-burning furnaces. Instrument includes light source in dust-tight

WORRYING ABOUT
FROZEN
AIR-LINES?



Air-lines exposed to as low as 50° below zero will not give you trouble when the ANDERS fully automatic DEHYDRATOR* is installed.

ANDERS fully automatic DEHYDRATORS keep the air supply *clean* and *dry* and free from oil and water vapors.

ANDERS fully automatic DEHYDRATORS are available in 10 sizes for 25 to 2500 air controlled instruments. Steam or electric activation.

Explosion proof construction available for use in hazardous areas.

Priced right—for the small and large installation.

*Davison Silica Gel

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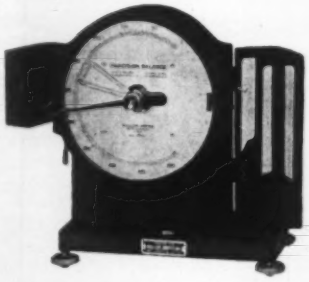
Engineering Department
Anders — Compressed Air Dehydrators
THE ANDERS COMPANY
420 LEXINGTON AVENUE
NEW YORK 17, N. Y.

"A DRY AIR-LINE NEVER RUSTS"

Make your tedious weighing job

Simple and Routine with Roller-Smith

PRECISION BALANCES



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IN ASSAYING — RESEARCH — PRODUCTION CONTROL—ANALYTICAL WORK

In the Manufacture of

Chemicals - Textiles - Lamp Filaments - Radio Tubes - Explosives - Watches - Paints - Biologicals

The **Roller-Smith Precision Balance** is universally used for weighing within the range of 3 mg to 150 grams. Everyday applications include the measurement of liquid surface tension, yarn numbering, counting extremely small parts by weight, assaying precious ores, weighing diamonds and specific gravity determinations.

The **Roller-Smith Precision Balance** is the result of careful research and painstaking design to produce a better means for *rapid weighing, quality control* and *uniformity* in the manufacture of your products.

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The **Roller-Smith Precision Balance** is backed by over *40 years of research and development experience* in the engineering of fine products. Let **Roller-Smith** help you with your weighing problems.

Write now for the **Roller-Smith Precision Balance Catalog 4540.**

ROLLER-SMITH

aluminum case and photocell which operate time relay when smoke in flue reaches pre-determined density. Relay turns on air jets for pre-determined period, adjustable from 20 seconds to 20 minutes, then turns off jets. Lamp is mounted on tripod for directing beam correctly and unit has built-in voltage regulator. Red light also flashes when smoke is at high concentration.—*Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia 44, Pa.*

Please mention number 1248 when filling out card

Piston Pin Checking-segregating Machine

New machine checks piston pins for average diameter and automatically segregates into six classifications. Pins

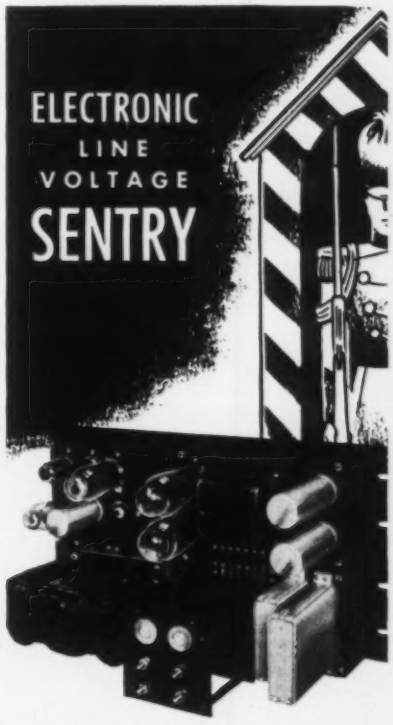
are manually loaded into chute which has "no go" gaging fixture to prevent oversize parts from being accepted. Remaining parts are gravity fed into locating "V" then into air ring where they are checked by jets mounted in ring. Solenoids open and close trap doors to segregating chutes. Production segregating rate is approximately 2400 pins per hour.—*The Sheffield Corp., Dayton 1, Ohio.*

Please mention number 1249 when filling out card

Color-temperature Indicator

New "Spectra" direct-reading color-temperature meter eliminates a common cause of bad results in color pho-

tography by eliminating guesswork in determination of color of light (on standard color-temperature scale) from continuous-spectrum sources. It embod-



Rear View STABILINE Type IE

The Superior Electric STABILINE Automatic Voltage Regulator acts as a sentry — always "on duty" to maintain a constant voltage to electrical apparatus. Type IE, an *all-electronic* regulator, acts instantaneously to keep delivered voltage to within ±0.1 volts of the preset value, regardless of line variations. STABILINE Type IE will hold the output to within ±0.15 volts for any load current change or load power factor change from lagging .5 to leading .9. Waveform distortion never exceeds 3 percent — a negligible error not recognized in instrument readings.

Bulletin 547 gives you information on this and other Superior Electric voltage control equipment. Write for your copy today.

THE

SUPERIOR ELECTRIC

COMPANY

712 MEADOW STREET

BRISTOL, CONN.

Century
RECORDING GALVANOMETERS

For photographic recording of d.c. or a.c. currents with "flat" frequency response to as high as 2500 cycles per second. Available in a wide range of natural frequencies, all having high factors of sensitivity and dynamic balance. Their tubular hermetically sealed construction insures long-lived dependability and ruggedness. Magnetic assemblies are constructed for 2, 4, 8, 12 and 14 element mounting.

Century also offers a complete repair service on all types and makes of oscillograph galvanometers. Recent expansion of facilities makes possible immediate service.

Manufactured under Century Pat. 2439576, also licensed by Kannestine Laboratories Patent 2149442.

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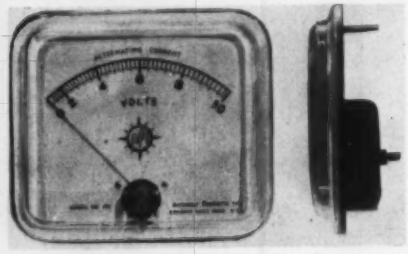
ies a photocell and a direct-deflection indicator, thus obviating need of peering through colored-glass wedges. Range 2000 to 30,000°K. (from candlelight to most intense blue sky). Instrument comes with tables telling what filter and filter factor to use.—*Photo Research Corp., 15024 Devonshire St., San Fernando, Calif.*

Please mention number 1250 when filling out card

Seven-inch Electrical Indicating Instruments

New large-front electrical indicating instruments are announced. Front measures 7⅛" × 6⅛"; is one-piece clear molded Lucite. Scale length is 6". Pointer length is 4". Both d-c. and a-c. types are available. Ranges: 20 micro-



amperes to 50 amperes d.c., 5 milliamperes to 50 amperes a.c., 10 millivolts to 500 volts d.c. and 1 volt to 1000 volts a.c. Higher ranges of amperes or volts with external multipliers. New instruments are also supplied mounted in blocks for use as portable secondary standards for laboratories and shops; are said to be ideal for student use.—*Assembly Products Inc., Main and Bell Sts., Chagrin Falls, Ohio.*

Please mention number 1251 when filling out card

Sound Analyzer

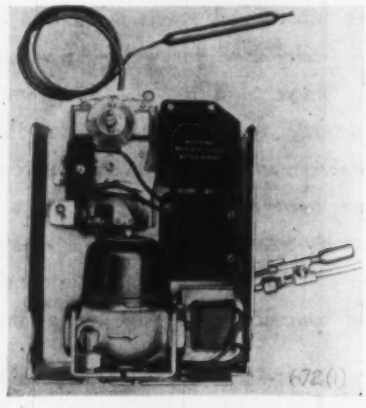
New "Model AP-1" sonic analyzer, permits complete sonic analysis by automatically separating frequency components constituting complex audio wave and simultaneously measuring their frequency and amplitude. "AP-1"

is said to open entirely new possibilities for investigating audio phenomena, devices and systems. With "AP-1," audio components are displayed spectrographically on cathode-ray tube screen. Instrument tunes repetitively, once per second, through frequency range from 40 to 20,000 cps. Instrument is said to eliminate complicated point-by-point frequency checks; enable observations of changes in wa eform content; remove the chances o skipping by weak components; rovide quick overall view of audio spe trum, and allow measurement of ind idual intermodulation envelope comp nents. "AP-1" is direct reading; specia light filter is calibrated logarithmically from 40 to 20,000 cps. along its hor zontal axis; vertical axis, calibrated for component amplitude measurements, has linear scale with 10:1 range and log scale of 40 db. Selector switch extends overall range to 1000:1, or 60 db. Input voltage range is 500 microvolts to 500 volts; constant input impedance is 250,000 ohms. Fourier analyses of square, rectangular, triangular and saw-tooth waves can also be made for either research or demonstration purposes. Unit operates from 115 or 230 volt, 50-60 cycle source; power consumption is 100 watts.—*Panoramic Radio Corp., 92 Gold St., New York 7, N. Y.*

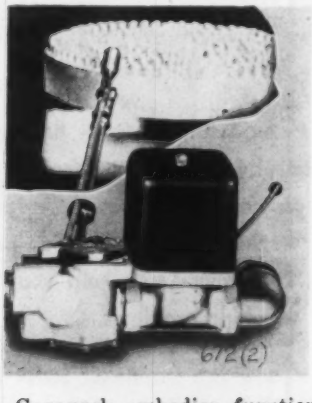
Please mention number 1253 when filling out card

Water Heater and Furnace Control Systems

New line of water heater and furnace valves includes "Water Heater Gasapack" which combines automatic safety



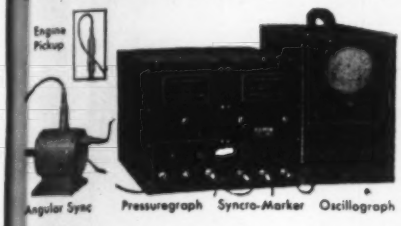
pilot, thermostat, powered valve and pilot, filter (where required) in one package. Capacity is approximately 35,000 BTU/hr. for mnufactured gas, 55,000 BTU/hr. for natural gas. "Fur-



nace Gasapack embodies functions of gas cock, electric powered valve, automatic safety pilot and limit control in one compact unit. Capacity is listed as 65,000 BTU/hr. for manufactured gas and 90,000 BTU/hr. for natural gas. "Gas Unapac" control system combines

New Tools You Should Have for **PRESSURE RESEARCH**

The Synchro-Marker
PRESSUREGRAPH



Here is your complete answer in instrumentation for checking pressure variations, both regular and instantaneous. Provides oscillograph pictures showing relation of pressures to engine shaft rotation (top dead center) or indications in degrees of rotation and also relates pressure to time (milliseconds).

Accurately measures pressure rise with time. Can be applied to hydraulic, gas, steam or pressure line measurement of static, dynamic or instantaneous pressures.

New detachable diaphragm permits measurement in any pressure range from vacuum to 14,000 p.s.i.

Now used in oil fields by many leading producers.

ITS LITERATURE

Write for your copy of "Pressure Indications in Engine Fuel Research" illustrating typical Pressuregraph applications and giving data on dynamic studies of pressure waves.

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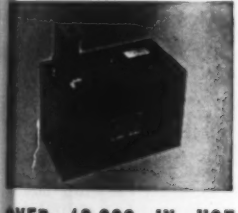
HERE'S HOW EASY IT IS
TO TEST MOISTURE CONTENT WITH A
Steinlite



1. Turn on switch, adjust needle on meter dial.
2. Weigh out an accurate sample.
3. Pour sample into can and take temperature.
4. Pour sample from can immediately into funnel. Trip lever and let sample fall into test cell.
5. Push A, B, C or D buttons progressively until reading is obtained on meter dial.
6. Convert reading on meter dial to actual moisture percentage by means of handy conversion charts, and get final moisture percentage reading.

OVER 12,000 IN USE

Steinlite is the most popular electronic moisture tester on the market. Used in elevators, mills, feed processing plants and by many Board of Trade Sampling Departments, and Government Grain Inspection Offices. It operates on the radio frequency impedance principle. Calibrated against official government methods. Sold on a 10-day FREE TRIAL basis.

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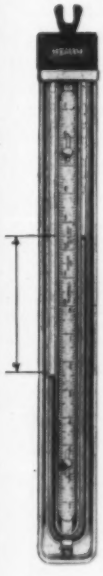
For 37 years we have been solving measurement problems by supplying standard or special instruments to accurately measure pressures, vacuums and flows of liquids and gases. We have constantly improved, developed and diversified the line so as to meet fully all needs of the field.



U-TYPE MANOMETERS

The Clean-Out Manometer (at left) for line pressures up to 100 lbs. per sq. in. A wing nut permits the Manometer body and tube to be disconnected from the head — the tube cleaned with a brush furnished or tube replaced, and the instrument reassembled without disconnecting the head section from the piping. Send for Bulletin No. 1.

The Model A-995 WM Manometer for line pressures up to 400 lbs. per sq. in. These instruments are built with heavy walled annealed straight Pyrex tubes, gland packed top and bottom in steel end blocks and clamped to the body at fixed intervals to prevent distortion. Catalog Sheet A-995 WM gives complete details.

WELL-TYPE MANOMETER

Model A-275 WM (at left) is a direct reading type for line pressures up to 150 lbs. per sq. in. Standard construction; ranges — from 6" to 24". Wall mounted type shown; also available in flush mounting. Ask for Catalog Sheet A-275 WM.

SIGHT FEED BUBBLER

This Sight Feed Bubbler with 2½" dia. bowl of Pyrex glass is good for line pressures up to 50 lbs. per sq. in.; of plastic, for pressures up to 100 lbs. Sturdily built with brass or semi-steel body. Supplied in ring type (shown) and strap type. Needle valve controls bubbler rate. Ask for Bulletin 21.

THE MERIAM INSTRUMENT CO.
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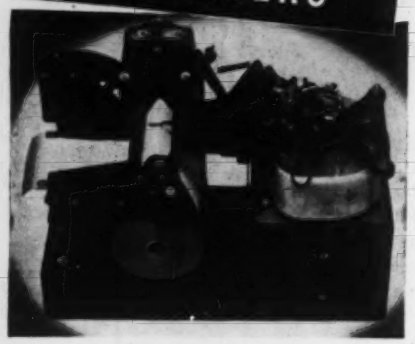
ESTABLISHED 1911
MANOMETERS, METERS AND GAUGES FOR THE ACCURATE MEASUREMENT OF PRESSURES, VACUUMS AND FLOWS OF LIQUIDS AND GASES

DIRECT WRITING RECORDERS



Galvanometer available separately if desired

PERMANENT Records
•
NO INK
•
RECTILINEAR Writing
•
RUGGED Construction with EXTREMELY HIGH torque movement (200,000 dyne cms for 1 cm deflection)

While designed primarily for use in the Sanborn direct-writing electrocardiograph (the Viso-Cardiette) this assembly (or the galvanometer alone, if desired) has sufficient potential value for varied industrial applications to warrant this announcement of availability for non-medical uses.

The complete unit illustrated comprises the galvanometer and writing arm, with associated paper drive (No. 572M – 500). The galvanometer and writing arm are available as a separate unit (No. 572M – 300). Recording styli available in two types; fine line writing approximately 1/3 mm; wide line writing approximately 1 mm. Recording paper can be furnished in 200 ft rolls, 6 cm wide (No. 572-737-P3).

TABLE OF CONSTANTS

Sensitivity	10 ma/1 cm.
Coil resistance	3,000 ohms, center tapped for push-pull operation.
Critical damping resistance	500 ohms.
Undamped fundamental frequency	45 cycles/sec.
Stylus heater requires from external source	1.25 volts, 3.5 amps, AC or DC
Maximum undistorted deflection	2.5 cm. each way from center
Marker requires from external source	1.25 volts, at 1.5 amps, AC or DC
Paper speed	25 mm/sec.
Chart ruling	1 mm intervals

In the development stage are other Sanborn "medical recording" instruments which have apparent industrial applications. These include an Electromanometer for direct measurement of "pressures", and several models of multi-channel (2 to 6) recorders, both direct recording and photographic.

For descriptive bulletin write to

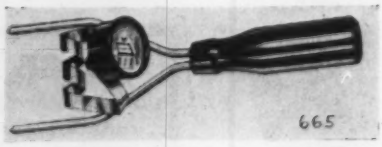
INDUSTRIAL DIVISION
SANBORN COMPANY
39 Osborn St.
Cambridge 39, Massachusetts

solenoid valve, combination fan switch and limit control, automatic pilot, and built-in transformer.—*Automatic Products Co., Milwaukee 10, Wis.*

Please mention number 1254 when filling out card

Battery Tester

New "Model 610A" high-discharge cell tester is handy device for checking condition of batteries. Dial is divided

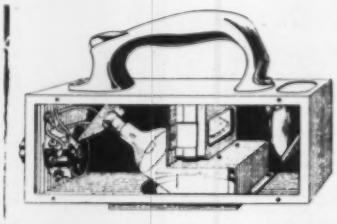


into three colored areas marked "dead," "weak" and "ok". Pointed terminals are 3¾" apart for ready connection with battery terminals. Device is 12" long and 4" wide—*Sterling Mfg. Co., 9205 Detroit Ave., Cleveland 2, Ohio.*

Please mention number 1255 when filling out card

Portable Glossmeter

New glossmeter measures specular gloss of paint according to A.S.T.M. Method D523-447, also useful for studies

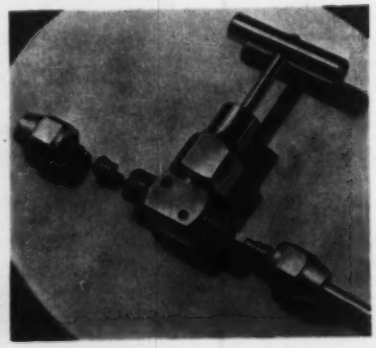


designed to show need for re-painting, and in testing lighting conditions in schools, offices, etc. Accuracy of ±2% is claimed. Meter is of 60° type having lens, high sensitivity lightmeter, lamp and scale within housing. Lamp may be replaced without re-calibrating scale. Available for 110 volts a.c., for battery operation or both.—*Henry A. Gardner Labs., 4723 Elm St., Bethesda 14, Md.*

Please mention number 1256 when filling out card

Laboratory Valve for Quick Installation

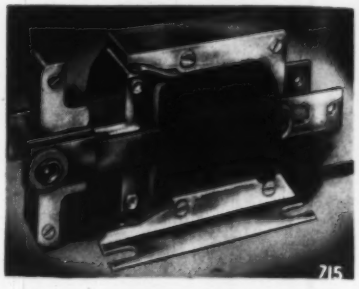
New "Speed Valve" was designed for using "Ermeto" seats. This minimizes assembly set-up time in Laboratory: no threading or beveling of tubing necessary. Gas-tight seal is suitable for operating pressures up to 6000 lbs. Valve body is fabricated of Type 303 stainless steel, and valve stem of Type 410 stainless steel properly heat treated. Neoprene packing is supplied. Valves are available from stock in two sizes for use with ¼" O. D. tubing, 18-gage wall; and ⅜" O. D. tubing, 16-gage wall.—*Autoclave Engineers, 3737 W. Courtland St., Chicago, Ill.*



Please mention number 1257 when filling out card

Push-type Solenoid

New "TT Type" solenoid, a push type unit, has same features as maker's pull type unit. Plunger stroke is 1 1/16 in.,

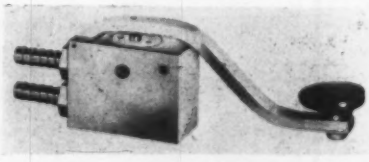


with thrust varying from 4 to 12 lbs. for an intermittent-duty unit and from 3 to 10 lbs. for a constant-duty unit. New solenoids can be wound for any 60-cycle voltage; mounting brackets for horizontal or vertical mounting.—*Soreng Mfg. Corp., 1901 North Clybourn Ave., Chicago 14, Ill.*

Please mention number 1258 when filling out card

3-way Air Valves

New "Models FT-101 and FC-101" 3-way air valves, companions to maker's "FT-1" series have minimum open-



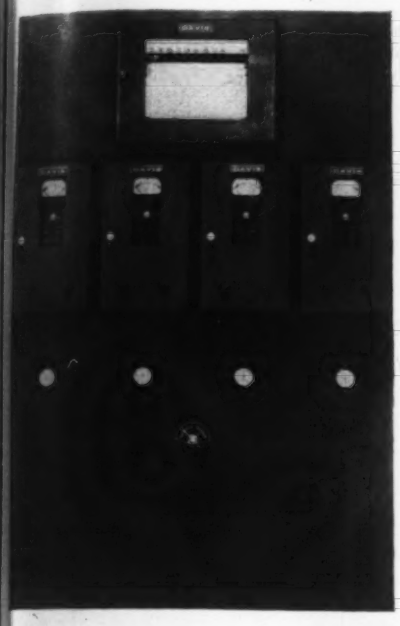
ings of 5/16" throughout, making them quicker-acting with larger air cylinders, yet retaining light touch and instant response. Valves are of poppet type, fitted with hose nipples to take ⅜" I. D. and up to ¾" O. D. hose. Easy to attach to any machine for either cam or finger-tip operation. Available only in normally closed or "OFF" type.—*Mead Specialties Co., Dept. FT-37, 4114 No. Knox Ave., Chicago 41, Ill.*

Please mention number 1259 when filling out card

Decade Resistance Boxes

New "Model 1900" decade resistance boxes for use in connection with making measurements of electrical characteristics, particularly where wide variations in resistance values are encountered, are said to provide accuracy of 0.1% and are wound with low-tempera-

PROTECT YOUR PLANT AGAINST GAS HAZARDS



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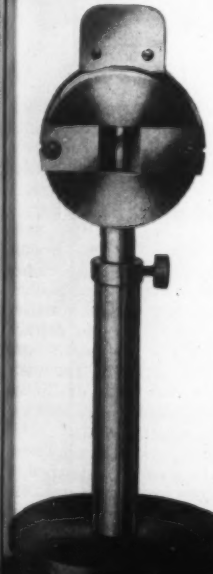
Thermopiles



For many years the thermopile has been the accepted instrument for measuring Radiant Heat from Radiant Heaters at the American Gas Association Testing Laboratory in Cleveland, Ohio. Since 1930, when Vandaveer first described his work in this field,* an Eppley thermopile has been used for this purpose in hundreds of tests and the results have been consistent and accurate to within 1 per cent.

This is but one of many applications in the field of radiant energy measurements for which Eppley Thermopiles are ideally suited. They may be obtained with windows of different materials, and various types of black are available for receiver coatings.

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If you have a problem involving the measurement of radiant energy we invite you to write us, describing your problem in as much detail as possible. We will be glad to make recommendations and there will be no obligation.

***Vandaveer, Industrial & Engineering Chemistry, Vol. 22, page 596, June 1930.**

BULLETIN No. 3 ON REQUEST

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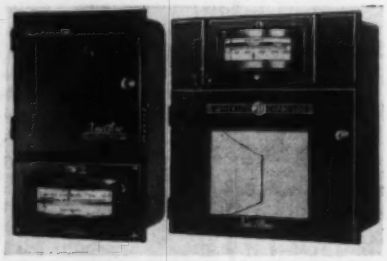
ture coefficient wire. Boxes are sealed against moisture and each decade assembly is shielded by partition integral with case. Switches have silver contacts and control knobs are large. Boxes are available in 2-dial to 5-dial assemblies, smallest being 8½" long, 5" wide, 4¾" high and weighing 4 lbs. Largest is 20" long, 5" wide, 4¾" high and weighs 9½ lbs. Range varies from 11 ohms total in steps of 0.1 to 111,110 ohms total in steps of 1.0.—*Cole Instrument Co., 1320 S. Grand Ave., Los Angeles 15, Calif.*

Please mention number 1260 when filling out card

Indicating and Recording Temperature Controllers

New "Xactline-Capacitrol" and "Xactline-Capacilog instruments for indicating and recording temperature control, combine conventional pyrometer control



features with auxiliary devices for maintaining precision temperature control. Applicable to any electrically-heated or fire-fired oven or furnace equipped with motor-operated valve or solenoid valve. Advantages claimed are: only one instrument required; costly "overshooting" and "undershooting" eliminated, and rejects caused by broad-range heating are sharply reduced.—*Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16, Ill.*

Please mention number 1261 when filling out card

Voltage Stabilizer

New model of maker's "VR6000" line of voltage stabilizers is hermetically-sealed, frequency-compensating instrument of 15-watt rating, for input frequency range of 57 to 63 cps., input voltage of 95 to 125 and output of 115 volts stabilized to ±1% for both line and frequency regulation. Stabilizer is oil-filled for cooling efficiency, has maximum resistance to shock; and case is

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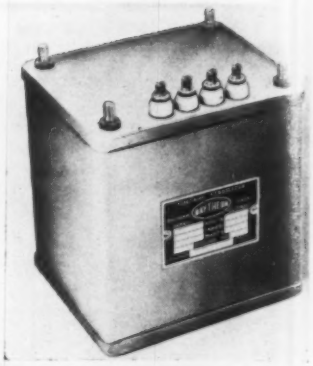

plated before painting. — *Raytheon Manufacturing Co., Waltham 54, Mass.*

Please mention number 1262 when filling out card

Turbine Blade Fatigue Tester

New "Sonntag SF-5" fatigue testing machine subjects turbine blades and

materials to fatigue loads under conditions similar to those in high temperature turbine service. Machine applies alternating flexure loads up to ±1350 lbs. to specimen at frequency at 3,600 cps. while at temperatures up to 1800°F and under tensile loads up to 8,000 lbs. Machine is mounted on frame that floats on seismic springs, thus preventing transmission of vibrations to floor.—*Baldwin Locomootive Works, Philadelphia 42, Penna.*

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Instrument Lubricator

New spring-loaded automatic lubricator provides a solution to many orifice meter-bearing shaft lubrication problems. It continuously lubricates entire bearing surface. It utilizes pressure in the instrument plus a light coil spring which is, in turn, connected to a steel piston and a low-friction flexible cup. This cup provides a positive seal within bore of lubricator. Spring-loaded piston-and-cup mechanism provides positive sustained pressure upon grease supply slightly in excess of the measured gas or liquid pressure. Resulting differential makes it impossible for gas or liquid to penetrate shaft housing at critical point where shaft enters meter pressure chamber. Vapor locking and freezing of bearing shaft due to entrance of high-pressure wet gas entering and contacting bearing surfaces is eliminated. Contamination and deterioration of lubricant by highly volatile liquids is prevented. Corrosion and permanent damaging of bearing shaft and part is eliminated.— *J. P. Squier, Duval Williams, 2620 Cedar Springs, Dallas 4, Texas.*

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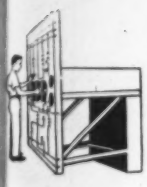

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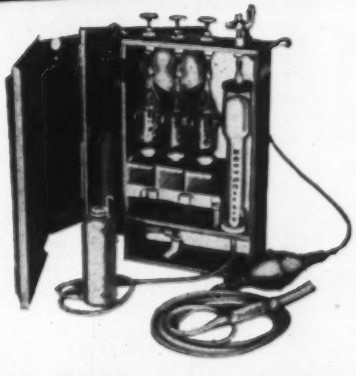

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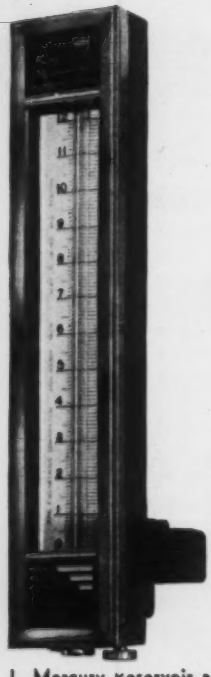

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TECHNICAL SOCIETIES

Analytical Symposium and Exhibition

The Fourth Analytical Symposium sponsored by the Analytical Division of the Pittsburgh Section of the American Chemical Society will be held at the Hotel William Penn on January 20 and 21. One of the features will be a talk by Dr. I. M. Kolthoff on "The Role of Reaction Kinetics in Analytical Chemistry."

Other papers will be presented by Edmund Ball, J. R. Churchill, B. L. Clarke, N. D. Coggeshall and A. S. Glessner, Jr., M. D. Cooper, P. J. Elving, W. L. Emerson, Henry Freiser and A. E. Spakowski, John L. Hague, W. J. Happel and N. D. Coggeshall, J. L. Kassner, William MacNevin, W. J. Mader and H. A. Frediani, W. Peiffer, W. R. Sayre, V. A. Stenger.

Discussion periods will follow the scheduled addresses.

Dr. Walter J. Murphy, Editor of *Chemical and Engineering News* and of *Analytical Chemistry* will act as toastmaster for the symposium banquet January 20 and the speaker will be Dean Burk of the National Cancer Institute.

The exposition of new analytical tools will be comprehensive; outstanding companies will exhibit their new instruments.

Hotel reservations should be made directly with the Hotel William Penn stating the purpose for which requested.

Those interested in obtaining separate copies of the complete program and abstracts, to be ready early in January, should write to Dwight L. Deardorff, Mellon Institute, Pittsburgh 13, Pa.

A.I.E.E.-I.R.E.-N.B.S. Conference on High-frequency Measurements

A conference on high-frequency measurements sponsored jointly by the American Institute of Electrical Engineers, the Institute of Radio Engineers and the National Bureau of Standards will be held in Washington, D. C., on January 10, 11, and 12. Purpose of the symposium is to bring together those interested in high-frequency measurements and measuring apparatus at a meeting devoted solely to these topics. To this end, an excellent technical program consisting of four sessions over a 3-day period has been planned to include surveys of various branches of the art and presentation of latest developments in measuring technique.

This is the first national conference devoted solely to high-frequency measurements. It is in line with the present AIEE policy of sponsoring conferences to cover a single field.

Washington was chosen because of government laboratories and great interest in the subject in that area. Registration and general headquarters will be at the Roger Smith Hotel. Registration fee $2. All technical sessions will be held in the Department of Interior Auditorium.

WHEN A FELLER NEEDS CONTROL

By Phil Putnam

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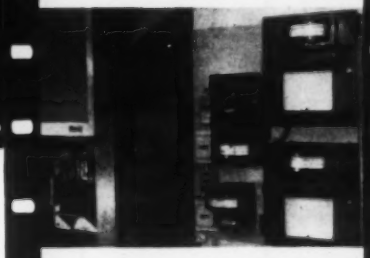
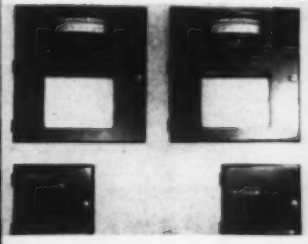


Laboratory



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THE DERIVATIVE CONTROLLER

(Concluded from page 1099)

powerful stabilizing influence. When the derivative time is at the correct value, it results in the Controller being more stable so that its proportional band width may be materially improved. The amount of improvement becomes more and more noticeable as the process difficulty increases, and it follows therefore that the derivative should always be specified on the more difficult processes (often those for the control of temperature).

The foregoing discussion has been based on a Proportional Controller with Derivative, and mention of Reset has been omitted to simplify the presentation. The addition of Reset to the control system in no way alters the state facts. An examination of the control system will show that the Reset function has no effect upon the operation of the derivative function or vice versa.

The "Hyper-Reset" Controller, shown in Figs. 13 and 14, is the "Stabilog" Controller to which derivative has been added, using the compound bellows construction. As has been explained in this discussion, the function of the inner bellows is NOT to produce a derivative effect. This effect is produced by the derivative RESISTANCE. The only function of this inner bellows is to modify the pure derivative effect so that the controller will not react significantly to measurement motions produced by extraneous influences.

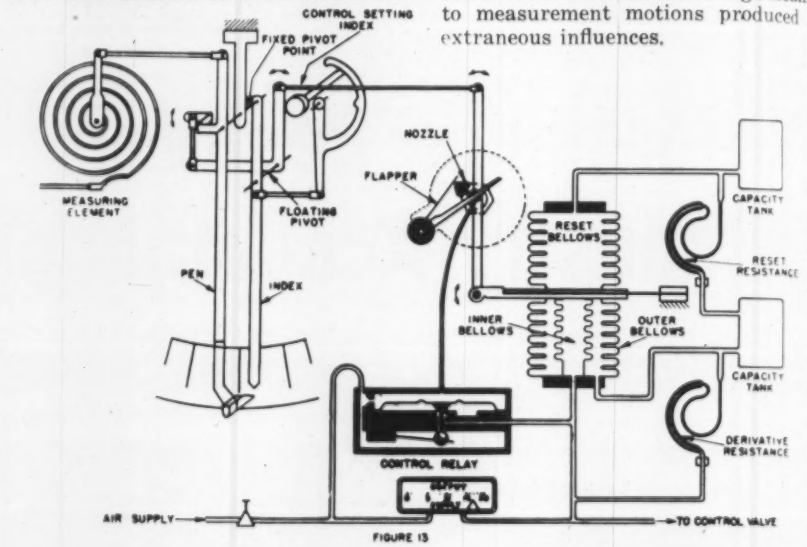

FIGURE 13

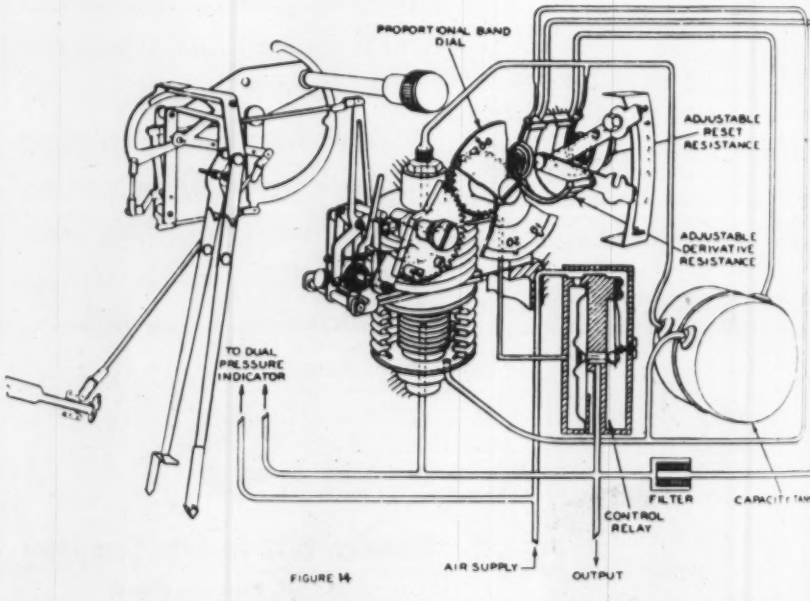

FIGURE 14

"Doll House" Lab Speeds Petroleum Research

[SEE COVER PHOTO]

PITTSBURGH.—How progress toward meeting history's greatest demand for oil is being aided by the microlaboratory was revealed by Gulf Oil Corp. Quantities of materials a hundred thousand times smaller than used in ordinary research are manipulated by Lilliputian instruments and are analyzed much more quickly than normal amounts. A micromanipulator enables the scientist to work in a drop of water under the microscope as if he were using materials in beaker and test tube.

JOURNAL of the
Instrument Society of America

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Vol. 3 — December 1948 — No. 12

General News

Carl Kayan Heads M. E. Dept. at Columbia University

As we go to press, word has just been received that our National President, Carl F. Kayan has recently been elevated to Head of the Mechanical Engineering Dept., at Columbia University. Congratulations, Carl and best wishes.

Inspection and Test Engineers to Form Group

A rather unusual meeting was held at the Hotel Henry, in Pittsburgh, on Tuesday evening, November 16, 1948 at 8:15 p. m. A steering committee made up of J. Manuele, Westinghouse Electric Corporation; A. S. Marthens, U. S. Navy; John Redmond, Koppers Company; with ISA Secretary Rimbach called a meeting of inspection and test engineers to discuss the need for organizing a group to meet their special needs.

The steering committee arranged a program on Pneumatic Inspection Devices presented by the following speakers: J. Bouslough, Federal Products Corp. Frank Blanchette, Moore Products Co., and Louis Mahlmeister, Sheffield Corp. A demonstration of pneumatic gages was also arranged.

The meeting was attended by over ninety individuals from the following companies:

Aluminum Co. of America
American Steel Foundry
Armstrong Cork Co.
Gulf Research and Development Corp.
Jones & Laughlin Steel Corp.
McConway & Torley Corp.
Mine Safety Appliances Co.
National Tube Co.
Oliver Iron & Steel Corp.
Peoples Natural Gas Co.
Pittsburgh Coke & Chemical Co.
Rockwell Manufacturing Co.
Union Switch and Signal Co.
United Engineering & Foundry
U. S. Navy
Westinghouse Airbrake Co.
Westinghouse Electric Corp. (several plants)

After a very interesting presentation of the subject by the speakers, the meeting was opened for a discussion of an inspection organization by A. S. Marthens. The general opinion was that the needs of the group present at the meeting was not filled by any existing organization. Rimbach briefly enumerated the services offered by the Instrument Society of America. Further discussion from the floor resulted in a decision to have the steering committee and two additional members who were at the meeting carry on, and when they are ready to make a report to call another meeting of the group.

Mr. Frank Blanchette, Sales Engineer in charge of gages at Moore Products Co. said he will be very glad to help organize a similar group in Philadelphia.

The plans presented at this meeting were that such a group in Pittsburgh:

1—Could join the ISA as a sub-Section of the Pittsburgh Section.

2—One director would represent the present Section as well as this sub-group.

3—This inspection sub-Section would have its own set of officers: that is, Vice-President, Treasurer, and Secretary. The President would be over both.

4—The sub-Section would receive from the national office, one-half the dues of the membership of their sub-group.

5—The sub-group would have its own program, but the announcements of the present Section and the inspection sub-Section would each month include both programs.

6—Two or three times a year the groups could have simultaneous meetings covering business matters.

There are a number of Sections that could assist in organizing inspection and test groups in their cities at once. The ISA National office is prepared and willing to assist.

Program for New York Section Two-Day Conference in Jan. 1949

The technical program of the two-day Conference on "Pressure Measurements and Applications" being conducted by the New York Section of the Instrument Society of America, follows.

Two technical sessions will be held on Friday, January 28th, at the Hotel Pennsylvania on "Pressure Instruments and Measurements." The Saturday sessions, held at the same location will be devoted entirely to the adjustment, calibration, servicing and other maintenance problems associated with instruments of this category.

TECHNICAL PROGRAM, Hotel Pennsylvania, 7th Ave. and 33rd Street, New York City, Friday, January 28, 1949.

8:45 to 9:30 A. M.—Registration.

9:30—Technical Session, W. G. Brombacher (National Bureau of Standards) Chairman.

(A) The Conference keynote remarks will be given by Mr. Brombacher. "Some Problems in the Precise Measurements of Pressure."

(B) Barton Edeson, Consulting Engineer: "A New Development in Pressure Sensitive Diaphragms."

(C) Clifford N. Sugden, Chief Engineer, Manning Maxwell and Moore "Bourdon Tube Theories."

12:30—Adjournment for Lunch.

2:00—Technical Session, J. B. McMahon, Republic Flow Meters, Chicago, and Vice-Pres. I.S.A., Chairman.

(D) Opening Remarks: "Applications of Pressure Devices in Science and Industry."

(E) C. B. Moore, Moore Products Corp., Philadelphia, Pa. "Overall use of Pressure in the Process Field."

(F) F. M. Jenner, Director of Research, Distillation Products, Inc., Rochester, New York, "Vacuum Measurements and Some Recent Applications."

(G) Prof. P. W. Bridgeman, Harvard University, Cambridge, Mass. "The Measurement of High Pressures."

(H) David Elam, Chief Engineer, Electro-Products Laboratories, Chicago, Ill. "Measuring Rapidly Changing Pressures and Some Applications in Industry" with demonstrations.

8:00 P. M.—Dinner Session.

Saturday, January 29th, Hotel Pennsylvania.

8:45-9:30 A. M.—Registration.

9:30-5:00 P. M.—Technical Sessions.

The Saturday Sessions, morning and

afternoon, will be of particular interest to service engineers and technicians who are concerned with the maintenance of industrial and scientific pressure instruments. This session will adjourn at 12:30 for luncheon, continuing in the afternoon, at 2:00 P. M. The Chairman of this program will be A. K. Joecks, Consolidated Edison Co., New York, New York. The morning session will start with a general presentation of the principles of pressure instruments from the viewpoint of their maintenance, by Prof. E. P. Lambe, Pratt Institute, Brooklyn, New York. Technical descriptions and demonstrations will follow, conducted by expert representatives of prominent user organizations and manufacturers. The talks will include the service, test, repair and re-calibration of pressure instruments, both in the field and in the shop, with particular attention to the practical aspects of the problems. The servicing viewpoint of both user and manufacturer will be stressed. Questions and problems from the floor will be invited.

While there will be no general distribution of invitations to all members of I.S.A. as was done before the winter conference in January 1948, all I.S.A. members and others interested in the problems associated with the application of pressures, are invited. The Conference Secretary, Norman J. Cherry, P. O. Box 608, Merrick, Long Island, New York, to whom inquiries may be directed. The President of the New York Section, I.S.A. is Ralph R. Batcher, 240-02 Forty-Second Ave., Douglaston, Long Island, New York.

A Further Report from the Employment Committee

At the meeting of the Board of Directors, September 11, 1948, in Philadelphia, Pa., the subject of levying a charge to cover printing and other costs of the Employment Committee on non-members and Associated Members of the Society using the Employment Service, was discussed. The discussion was concluded with the following motion, which was seconded and passed.

"The matter of Employment Service charges be referred to the Executive Committee, and that that Committee be given the power to take appropriate action after receiving legal advice."

At the meeting of the Employment Committee, September 12, 1948, Philadelphia, Pa., the subject was further discussed, and the following motion was made, seconded and passed to be effective until such time as the Executive Committee has had the opportunity to determine the legality of a charge and to take appropriate action.

"The Employment Service be restricted to full members, and that all others wishing to avail themselves of the Service be invited to full membership, in order to receive the benefit of this and other services of the Society."

Therefore, and until further notice, the Employment Committee will function as follows:

1—All registrants not full members of the Society have been notified of the action of the Employment Committee, and their application cards have been placed in our inactive file, or will be returned to the registrant if requested. An invitation to join the Society was extended to the non-members, Associate Members and Student Members, and a membership application form accompanied the invitation.

2—All future non-members, Associate Members and Student Members applications for registration with the Employment Service, will be advised of the policy, and an invitation extended to join the Society.

3—All replies to the listing of open positions in the Journal of the I.S.A., will continue to be accepted and forwarded to the prospective employers, but in the acknowledgement of the reply to those who are non-members, Associate Members and Student Members, an invitation will be extended to join full membership in the Society, in order to obtain the benefit of registration with the Employment Committee.

An application for Membership will accompany our letter, and the I.S.A. brochure of information will be included to all non-members. All Employment Committee members are requested to follow the foregoing procedure in the conduction of the activities of the Section Employment Committees.

C. F. Goldcamp, Chairman
Employment Committee

Report on the Employment Register

The Employment Register at the Third National Instrument Conference and Exhibit was a very real success, and surpassed the most optimistic expectations of the Employment Committee. Jim Hutchinson, Chairman, Employment Committee, Philadelphia Section, and the members of his Committee who conducted the Employment Register, did an exceptionally fine job, and has the sincere thanks of the Employment Committee. The Employment Register was operated during all the open hours of the 1948 show. During that time prospective employers reviewed the cards of applicants, and in any case where the qualifications were of interest, they were invited to take notes regarding where to contact those men they were interested in. In many cases the committee arranged for interviews right at the time, although this was not too easily done. Two jobs were actually filled during the week, in this manner and we have been notified of eleven additional positions filled since the close of the convention.

Applicants for jobs had an opportunity to look through the Committee's files on "open jobs." Early in the Convention it was decided that the most feasible way to handle this was to post all open jobs right on the large Bulletin Board of the Employment Register. This system had two advantages; first, it presented the only way to handle such large groups that wanted to see the listings; second, seeing the notices posted on the Board seemed to stimulate other visiting employers to wish to have notices of their own posted. A large proportion of the notices appearing on the Board were added during the course of the Show, as a direct result of this.

A noticeable deficiency was the lack of a suitable nearby room where applicants and employers could go to hold interviews, etc. A definite provision should be made for this at future Shows.

Gildersleeve Moves to West Lynn

After December 6, 1948, mail for the Chairman of the Sections and Membership Committee, Nelson Gildersleeve, should be addressed to him in care of General Electric Co., 40 Federal St., West Lynn, Mass.

Section News

CALIFORNIA

The Nov. 9th meeting was to be held at Eaton's Ardmore Restaurant in Los Angeles. Plans were complicated by election falling on Nov. 2nd, the regular meeting date. The scheduled speaker was Mr. Millard D. Shriver, Product Engineer, Bristol Co., Waterbury, Conn. on "Air Control Theory".

The Executive Committee, since adoption of the Section's new Constitution has formulated a set of By-Laws which have been distributed to all members.

CENTRAL INDIANA

The November 9th dinner meeting of the Central Indiana Section was held with the Service and Maintenance Division of the Electric League at the Riley Hotel in Indianapolis.

"Shipboard and Airborne Gunfire Control Equipment" was the topic of the two very interesting speakers from the Naval Ordnance Plant. Mr. N. W. Brinson spoke on Fire Controls and Mr. H. R. Whalen on Radar. The program was illustrated with charts, a motion picture and actual equipment.

Mr. E. C. Belzer will give a lecture-demonstration, on Telephone Equipment, at the December 7th meeting which will be held at 7:30 PM in the auditorium of the Indiana Bell Telephone Co. —E. E. Taylor, *Corr.*

CHARLESTON

At a new meeting place in the Ritz Cafe, fifteen steaks were served to members of the Charleston Section before the business session November 1st. Mr. E. I. Thomas, Chairman of the Nominating Committee, presented the following slate of officers:

President: R. S. Jones; T. J. Kirwin
Vice President: C. G. Fellows; H. K. Monk
Secretary: C. R. Bannerman, Jr.; A. H. Hix
Treasurer: G. S. Garrett; C. A. Williams
Executive Council: Charles Holz, F. J. Kaufman, R. D. Webb.

Balloting will be by mail with the terms of the elected officers starting at the close of the December meeting.

Mr. S. B. Spracklen of the Special Instrumentation Department, Instrument Division, Carbide and Carbon Chemicals Corp., South Charleston, delivered a lecture on the "Fundamentals of Electrical Measurement." Dealing with DC circuits, his talk was well supplemented with slides giving formulae, diagrams, and description. He was aided at the baloptican by Mr. R. S. Jones.

The third item on the fall calendar will be a discussion of "Gas Analysis by Thermal Conductivity, Combustion and Conductiometric Means." The speaker will be Mr. F. R. Davis, President of Davis Emergency Equipment Co. —Mary K. Adams, *Corr.*

EASTERN NEW YORK

The first meeting of the Fall-Winter season was well received on Tuesday evening, October 5th, at Siena College with 45 members and guests present.

Mr. J. P. Smith, President, opened the meeting with a few announcements pertinent to section business and then introduced Mr. Nelson Gildersleeve who in the absence of the National Director, Mr. G. F. Gardner, read his report on the National Conference and Exhibit.

We were fortunate to have not only one speaker for the evening but two, inasmuch as Mr. Richard Rimbach, Exec. Secretary of the National Office was on the agenda. Dick related the background of ISA, from its infancy to its present status. Due to a rather tight plane schedule Dick was not

able to stay to enjoy the Technical Speaker of the evening, Mr. Harold Larsen, Chief Engineer of W. & L. E. Gurley Instrument Co., of Troy, N. Y., who spoke on recent developments in survey instruments." Mr. Larsen's talk was well illustrated by a group of instruments that he had set up and these were demonstrated and brought forth many questions.

The November meeting was called to order with 18 members and ten guests present. Due to a change in the meeting night, attendance was off to some extent.

After the section business had been taken care of the program director introduced the speaker of the evening, Mr. E. J. Poitras of Fenwal Inc., Ashland, Mass., who spoke on the "Instrumentation of the Palomar Telescope" and "Application of Thermostats." Mr. Poitras is Director of Engineering for the Fenwal Co., and was Control Engineer for the Palomar Telescope Installation in 1947 and 1948.

The meeting in December is the annual meeting with election of officers and all section members should attend. Guests are also invited. —W. J. CLAFFIE, *Corr. Sec'y*

NEW YORK

The New York and New Jersey Sections planned their annual joint meeting for November 29th, at Mullens Cafe, 153 Chambers St., New York City. The speaker, Mr. Robert E. Tarring of Instrument Associates, Inc. was to discuss "The Flow Tube, a New Primary Device for Fluid Measurement". The New York Section has just been accepted as a member of the New York Joint Engineering Council.

NIAGARA FRONTIER SECTION

The regular October meeting, scheduled for October 25th, was postponed to November 1st, and was held at 8:00 PM in the New York State Institute of Applied Arts & Sciences in Buffalo, New York. A very brief business session was held after which the speaker of the evening, Mr. Henry W. Stoll of Taylor Instrument Companies of Rochester, New York, was introduced. Mr. Stoll's subject was "Applications and Engineering Considerations of Flow Measurement Installations." Although Mr. Stoll spoke for about 1¼ hours, considerably a longer period than most of our previous speakers, he very easily held the sustained interest of the 45 members and guests in attendance.

A greater portion of Mr. Stoll's discourse was of necessity on the subject of orifices, and all listeners gained some very practical and useful information on the correct method of installation, proper operating conditions and general characteristics of orifices and their relation to the instrument, with particular attention paid to the reason for high or low flow reading.

Mr. Stoll discussed in detail the limitations in design of Venturi tubes, and explained that certain standards are used in the manufacture of orifices, Venturi tubes and nozzles, so that the correction factor, once obtained through experimental tests on one certain unit, will hold good on reproductions of that unit.

Mr. Stoll responded to questions from the audience for a short period after his talk, following which the meeting was adjourned at approximately 10:00 PM.

The regular meeting of the Niagara Frontier Section was held November 22nd at 8:00 PM, at the New York State Institute of Applied Arts & Sciences in Buffalo. In President Boltz's absence, the meeting was conducted by Executive Vice-President Joseph Hildyard, who held a short business meeting, during which reports were received from Treasurer George Kellner and Membership Committee Chairman, Graham Hill. Following a brief discussion, it was decided to hold a Christmas party on December 20th, details of which are to be announced later.

Mr. L. H. Allen, Jr., of the American Viscose Corp., delivered a very interesting talk entitled "Automatic Control of Fractionating Columns and Accessories." Mr. Allen's discussion brought out very forcibly the prime importance of instrument control in this type of process manufacturing, and indicated the most acceptable and alternate types of control for the variables existing in the column. The six variables denoted as subject to instrumentation were Feed Rate, Product Withdrawal, Effluent Withdrawal, Heat Rate, Condenser Water, and Column Static. Suggested equipment for controlling these variables, in the same order, are Flow Controller, Temperature Controller, and Absolute Pressure Controller. The rate of reflux is maintained by a flow controller tied into the flow control on the feed rate.

Mr. Allen's discussion was well illustrated with slides depicting the evolution of the fractionating column from the original pot still. An interesting period followed after which the meeting was adjourned.

—W. J. SOMMERS, *Corr.*

PHILADELPHIA

On Wednesday, October 20th, the Philadelphia Section held it's regular meeting at the Bellevue-Stratford Hotel. The meeting was called by President Garner C. Parr. After the disposal of some routine matters the meeting was turned over to Mr. John Johnston, Jr., our member on the National Board of Directors, who reported to the local chapter on the Society's National affairs. Following Mr. Johnston, Mr. W. L. Hunt reported on the Nominating Committee's selection for local officers for the year 1949 as follows:

President, Alfred Krieg
Vice-President, Wm. J. Gallagher
Secretary, Clarence W. Wood
Treasurer, Charles F. Waag, Jr.
Member National Board Directors, George W. Ehly.

President Parr then asked for nominations from the floor but since none were forthcoming, nominations were closed. President Parr then turned the meeting over to Vice-President, Alfred Krieg, who introduced the speaker of the evening, Mr. R. R. Jackson, General Manager of the Paulsboro Refinery of the Socony Vacuum Oil Company. Mr. Jackson spoke on his scheduled theme of "What Management Expects of an Instrument Department." Mr. Jackson was in a unique position to cover the subject since he is a ranking executive of a large refinery who, over a number of years, has had direct contacts with instrumentation and automatic control as an actual operator of equipment. While of necessity, Mr. Jackson spoke with particular reference to the petroleum industry and more particularly of the Socony Vacuum Oil Company, he nevertheless covered the subject very thoroughly.

Mr. Jackson covered the organization of the Instrument Department, both with respect to instrument engineering and instrument maintenance. He discussed the selection of personnel, their training and the definition of their duties. He also discussed the economics of instrumentation in the refinery, and the effect of instrumentation on overall operations.

Following his very complete coverage of the subject, Mr. Jackson stood by for a question period during which he very ably answered a number of questions from the floor. At the conclusion of the question period, he was given a rising vote of thanks by the membership which totaled almost 300.

The next meeting, on November 11th, at the Bellevue-Stratford Hotel, will be devoted to a number of short talks by various manufacturers on new equipment and developments. —JOHN C. KOCH, *Corr.*

PITTSBURGH

The Pittsburgh Section held one of its most successful meetings on Monday, October 25th, at the Roosevelt Hotel. About 70 members and guests joined for dinner, and 120 were present when President Bob Kendig opened the meeting at 8:10 PM.

Treasurer Clark Fry reported on the financial situation, which shows the Section with a substantial balance. After a few announcements, the speaker of the evening was introduced. He was Mr. J. A. Pellettere of Gulf Oil Corp., who spoke on "Control Instrumentation." Four separate topics were covered.

Control point setting of one controller by another was advocated as the solution to several problems, and is almost a necessity when load, or pressure drop across the control valve, fluctuates widely. While it involves the cost of an additional controller, it will provide better control and also accomplishes the following: allows setting up safety limits; eliminates the control valve characteristic and overcomes over-size valve troubles; prevents over-ranging of flow meters in the line; and overcomes undesirable system characteristics.

Protective circuits using over-ride are coming into greater use. In this installation, two instruments are set up to control one valve, depending on previously established safe values. Typical installations are on hearth roof temperature, where a temperature control takes over from a flow controller on the fuel line if the roof temperature reaches a maximum. This case utilizes instruments in series. Special relays are used in boiler draft control where the controlling instruments are connected to an averaging relay, and the controller with higher output pressure takes over. Over-ride is also used in fuel selection, where yard gas pressure determines whether gas or oil shall be fired. Other methods of accomplishing over-ride are dual diaphragm valves and valves in series.

Control valves present problems for the quantity user because of the multitude of plug types and trims which must be stocked. Standardization of these items, and of the face to face dimensions, would be welcome. Improvement of the literature on valves would be a step forward, and a paper on the subject was promised for next year.

Tomorrow's instrumentation will provide smaller control boards, with more locally mounted controllers transmitting to indicators on the board. These would be combined with multi-function recorders, to which any transmitter could be connected when desired. The meeting adjourned at 9:15 PM.

On Friday, October 28th, the Section will inspect the Koppers Co. facilities at Kobuta for the manufacturing of styrene and polystyrene. Guide and speaker will be Mr. Carl Williamson. Dinner at the Hotel Brodhead in Beaver Falls will precede the meeting.

The meeting of November 22nd will present Mr. C. F. Havrilla, Fuel Engineer of Carnegie-Illinois Steel Corp., speaking on "Open Hearth Instrumentation".

—M. M. FROMM, *Corr.*

ROCHESTER

The October meeting was held October 26 at 8:00 PM in the Bausch & Lomb Physics Building on the River Campus of the University of Rochester, Rochester, New York.

Mr. Larry Haner, Research Engineer with DuPont Corp. at Buffalo, New York, was the speaker of the evening. Mr. Haner spoke on "Problems in Establishing an Electronic Research Group." For the last six years, Mr. Haner has been in charge of Electric Research at the Pioneer division of DuPont at Buffalo. Under his leadership, many new industrial developments have been carried through to process applications in the manufacture of rayon and other synthetic materials.

The speaker defined electronics relative to the other physical sciences involved in industrial research and explained the position of electronics relative to pneumatic, hydraulic, mechanical and electrical instruments in an effort to apply the best mechanisms to an industrial process. He pointed out that every phase of science was necessary to solve all the problems of instrument applications and that if an electronic instrument was not the solution to a problem, such an instrument was not forced into use. The misapplication of electronics in industry has done much to encourage the feeling that electronics is a magic that won't work too often.

Mr. Haner discussed the personnel that go to make an industrial research group and pointed out the background that best suits a man to this work. He pointed out that the war produced not too many good research men, and that industry must take

those individuals with some training and an interest and train them along the lines to best suit their research needs. The time alloted to pure research or "feeling around" outside reading, orientation, problem study, designing, etc. was set forth. It is necessary that research personnel know cost of parts, equipment and maintenance when designing an industrial application. They must know the trends of electronic applications and keep abreast of new developments. The speaker laid great emphasis on the three points relative to designing for a specific application: (1) make certain a research man gets his objectives clearly in mind and then let him go his own way, periodically checking without molesting to see if he still is on the right track; (2) fix the design in stages and then operate sufficiently in the plant to adequately determine if this is the instrument for the job and then give proper information relative to maintenance and operation when turning the unit over to operations; and (3) make certain that the equipment will be maintained if it is installed, including adequate shop facilities, repair parts and capable personnel.

Mr. Haner concluded his talk by showing a number of slides which illustrated the kind of equipment which his group had designed. The major pieces of equipment were pointed out by the speaker as the slides were shown. The last two slides gave several axioms relative to the aims and objectives of a research group and the major points to be considered when designing an instrument for a specific application. Space does not permit the printing of these, but Mr. Haner will no doubt be happy to supply these upon request. The most emphasized point was proper maintenance for an instrument installed.

The November 23rd meeting will feature a talk by Mr. William Howell, Research Director of the Foxboro Co. on the subject of "Electronic Instrumentation."

—CHARLES W. COVEY, *Corr.*

ST. LOUIS

The St. Louis Section held its November meeting on Wednesday, November 3rd at the Engineers' Club in St. Louis. Speaker of the evening was Mr. M. J. Boho of the Hagan Corp., who spoke on "Steel Mill Controls." Mr. Boho described controls for Coke Ovens, Blast Furnaces, Open Hearth Furnaces, and Soaking Pits, as well as controls for boiler furnaces using coke oven gas, oil, and coal singly or in combination. The controls consisted of controls for pressure, flow, ratio, BTU input, temperature, combustion, etc. From this it may be seen that almost all types of control may be found in the steel plant.

Mr. Boho's talk was well presented and illustrated, and was followed by an exceptionally lively question period, in which some of the fine points of the control problems were brought out. Attendance was approximately 50 members and guests.

The next meeting of the section will be on Thursday, December 2, at which time Dr. J. A. Becker, a member of the Technical Staff of Bell Telephone Laboratories, who will speak on "Properties and Applications of Semi-Conductors", with special emphasis on the Transistor, the revolutionary new device developed by Bell Laboratories which can be used as a substitute for the vacuum tube, having very striking advantages over that device. This new development should be of interest to all instrument people. This meeting will be held jointly with the Engineers' Club of St. Louis Section of the Institute of Radio Engineers, on Thursday, Dec. 2, 1948, at the Engineers' Club in St. Louis, at 8:00 PM. —HENRY E. ZEFFREN, *Corr.*

SOUTH TEXAS

The South Texas Section met on Nov. 2nd, in the Southern Alkali plant in Corpus Christi. The meeting was favored with a discussion on the photo-electric cell, by Mr. Sylvester Cathey, the Electrical Equipment Inspector from the Naval Air Station. This was followed by a motion picture of the attack on Pearl Harbor; which was loaned to us by the Commanding Officer of the Naval Air Station, through the good offices of Commander Powell, officer in charge of the Overhaul and Repair Department. A very satisfying meeting it was; being both instructive and entertaining.

Our next meeting is scheduled to be the winter social, at which we plan to have a dance, on Tues., Dec. 7th, whereupon our interest will be directed toward the mixing of certain well known chemicals and the performance of the instruments used in the production of syncopation and more or less harmonious melody. —L. NEEDHAM, *Corr. Sec.*

TENNESSEE

The November meeting of the Tennessee Section was held on November 10th at Kingsport, Tennessee. The principal speaker was Mr. W. A. Diament, Vice-President and Sales Manager of Fischer and Porter Co. Mr. Diament covered the theory of the Area Type flowrate meters and their application. The talk was well illustrated with pamphlets and slides showing the method of sizing flowrators and the historical development of the Fischer and Porter line. Following the talk the meeting was thrown open for a discussion period with Mr. Diament answering questions from the floor, and with general discussion from the entire group.

Following the main talk a short business meeting was held with Mr. J. H. Rion, first Vice President, presiding. The group voted to make Kansas City its number one choice for the ISA Show in 1951. The meeting adjourned at 10:00 PM. —J. T. ELDER, *Corr.*

WASHINGTON

On Monday, October 18th, the Washington Section held its first meeting of the season. Mr. Perry A. Borden of the Bristol Co. gave a very interesting talk on Industrial Telemetering. The material presented was basic in nature, and was well illustrated and clearly presented.

Prior to the meeting the speaker was entertained at an informal dinner at the Harrington Hotel Cafeteria. The number of members attending the dinner was larger than at previous meetings held in formal dining rooms. It is planned to continue having pre-meeting get-togethers in this cafeteria, and it it hoped that a large percentage of the members will form the habit of attending.

Mr. Nelson Gildersleeve of the newly formed "Sections and Membership National Committee" was present and spoke briefly to the officers and to the members of the section. The Washington Section is pleased with the formation of the committee, and with the implied improved contacts with the National officers and with other sections.

The regular monthly meeting was held Monday, Nov. 15th, with an attendance of 47. Dr. Leon F. Curtiss, Chief of the Radio Activity Section of the National Bureau of Standards and Chairman of the Committee on Nuclear Science of the National Research Council, spoke on the topic, "Radio Active Tracer Techniques and Measurements". Dr. Curtiss covered the general principles and problems of instrumentation in radio active tracer measurements in a discussion well illustrated with slides.

—RAYMOND E. MILLER, *Corr.*

WAYNE COUNTY

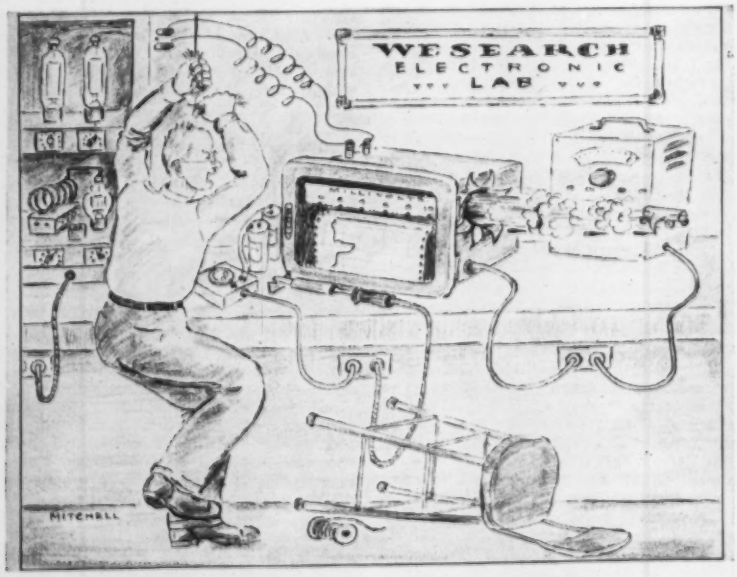
The November meeting was very well attended. The door prize was won by Mr. A. Caputi of the DuBois-Webb Co. The business meeting took up plans for our Christmas party. We will have a social evening for members, wives, and guests and will not have any formal business or program.

The program was sponsored by the H. H. Barnum Co. The speaker was Mr. Donald Eckman, author of "Principles of Industrial Process Control". Mr. Eckman spoke on "Control Valves and Their Power Units". Use of valve positioners for ironing out difficulties with tight valve stems, unbalanced valves, butterfly valves, etc., was explained. Several valve sections were shown and need of proper valve size selection was stressed. Mr. Eckman answered numerous questions from the floor, and at the conclusion showed and explained the action of the Conoflow Springless Diaphragm Valve.

—JOHN MACPHERSON, *Corr.*

(Continued on page 1142)

SEE ARTICLE ON PAGE 1137



"OVER RANGED AGAIN!!!" X X X "THAT SHUNT'S OUT AGAIN!!"
" — — — WHO TOOK THAT SHUNT AGAIN??"

The Author

The author was born September 12, 1919, in East Cleveland, Ohio. His Technical education was obtained at Case School of Applied Science and Massachusetts Institute of Technology from which he graduated in 1942 with degrees of B. S. and M. S. During a cooperative course at M.I.T. he worked in various test departments of General Electric Co. At River Works, Lynn, Mass., Philadelphia Works and West Lynn Works. Since June 1942, he has been in the Engineering Department of Sperry Gyroscope Co. in the Servomechanism Laboratory and for the past four years has been Senior Project Engineer in the Armament Engineering Department.

Robert S. Edwards

A Comparison of Small and Medium Power Electric Servomotors

By ROBERT S. EDWARDS*

Introduction

MANY types of present day industrial and military equipments require the use of servomechanisms. The term servomechanism has been defined in a number of ways but the usually accepted definition applies the word to that class of device in which the difference between output and input quantities is used to control the output in such a way as to make it agree with the input. Servomechanisms, or servos as they are usually called, have been used for many years in the instrument field for remote indication, recording instruments, process control and many other applications. During the last war servos were applied to many types of military equipment such as anti-aircraft directors and gun controls, radar sets, bombsights and the automatic control of airplanes and guided missiles.

The servos in the instrument field can be roughly divided into process controllers and mechanical rotation servos. This paper deals with the types of servomotors commonly used in the latter type. A mechanical rotation servo has for its output and usually for its input a shaft rotation. An example of this type of servo is the remote positioning of anti-aircraft guns so that the aiming point of the guns agrees with the calculated aiming point as computed by a director. Often the output of the computing mechanism is a shaft which has very low torque capability. The guns require a high torque and are usually located so that it is impractical to connect the two by any means except electrical wires. A synchro data system is used to measure the error, or difference in angle, between the guns and the director, and this difference is used to actuate the servomotor on the guns in such a way as to reduce the error to zero.

Factors Determining Choice of Servomotor

A number of factors are involved in the choice of the type of servomotor to be used for a particular application. The most important factor is performance.

Each application has its own requirements as to power or torque required to operate the load, characteristics of the load, maximum speed of operation, and allowable error under various conditions. The power required may be dependent on the friction loading of the output shaft or it may be required to accelerate the inertia of the load rapidly enough to obtain the desired dynamic performance. It should be pointed out that in any inertia calculations, the inertia of the servomotor and its associated gearing must be considered because in many cases it will be larger than the inertia of the load. A commonly used figure of merit for servomotors is the ratio of maximum stalled torque to inertia. This figure of merit is useful as a general guide, but should be used with caution since there are other important factors to consider. One of these other factors to be considered is the delay in the build-up of torque at the output shaft after a control signal is applied to the input terminals of the servomotor. It is interesting to note that in some cases where a large servomotor time delay is involved, the stability of the system can be improved by adding inertia to the load. This servomotor time delay may be due to the impedance that couples the motor to its controlling amplifier or it may be inherent in the design and construction of the particular type of servomotor. Examples of both types of delay will be discussed later in connection with specific types of servomotors.

The type of data system or error measuring device may affect the choice of a servomotor to a certain extent. If synchros or other electrical devices are used for the data system it may be most convenient to use an electric motor, and if a pneumatic error device is used, it may be most convenient to use a pneumatic servomotor. There have been a number of devices such as magnetically controlled high speed valves developed however, which do permit the use of a combination system. The scope of this paper will limit the discussion to the various types of electric servomotors.

The amount of power required to control a particular type of servomotor should also be considered. Generally the smaller the control power, the more convenient the servomotor is to use, but this may lead to other complications such as increased time delays that cannot be tolerated.

Another important determining factor in the choice of a servomotor is the source of power available. In most industrial applications, 60 cycle alternating current is available and in some cases direct current may be used. For aircraft applications however, the power sources are usually low voltage direct current, 400 cycle alternating current or in some cases alternating current of constant voltage but of frequency which varies between 300 and 1600 cycles per second.

The weight and size of the servomotor and its associated equipment may not be extremely important for industrial applications but in aircraft use or in any system that must be readily transportable the size and weight are of utmost importance.

One very important consideration is the vulnerability of the servomotor to service difficulties. For industrial applications, the extremes of temperature, humidity and altitude are not as rigorous as for aircraft applications, but industrial equipment must generally go for long periods of time without service and must have a long life. Aircraft and military applications generally do not require such a long life, but dependability during normal operating life must be very good, and operation is required over wide variations of climatic conditions.

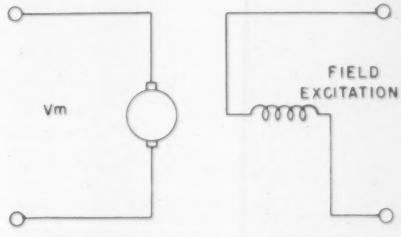


Fig. 1. D-c. shunt motor schematic.

D-C Servomotors

A conventional shunt connected d-c motor can be used as a servomotor. If we first consider the separately excited motor shown schematically in Fig. 1 with a constant field excitation the usual shunt motor equations apply.

$$V_m = E_m + I_a R_a$$

where V_m is the terminal voltage, E_m is the back emf generated in the motor due to rotation and $I_a R_m$ is the voltage drop due to the resistance of the motor armature. The back emf

$$E_m = K_1 \Omega_m$$

and the developed torque of the motor

$$T_m = K_2 I_a$$

*Sperry Gyroscope Co., Great Neck, L. I., N. Y.

Paper presented at the Third Annual Conference of the Instrument Society of America, Sept. 13-17, 1948, Philadelphia, Pa.

Note: Statements and opinions, etc.

where Ω_m is the motor speed and K_1 and K_2 are constants dependent on the motor design. From the above we have:

$$V_m = K_1 \Omega_m + \frac{T_m}{K_2} R_m$$

or

$$T_m = \frac{(V_m - K_1 \Omega_m) K_2}{R_m} \quad (1)$$

Equation 1 above gives the family of torque-speed curves shown in Fig. 2

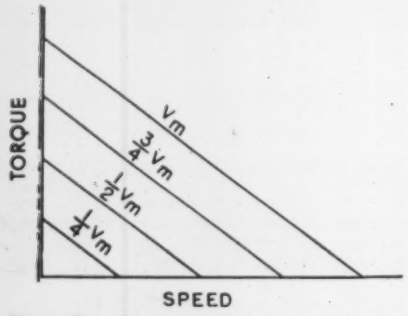


Fig. 2. D-c. shunt motor armature control torque-speed curves.

for various values of applied voltage. These curves indicate that this motor is equivalent to a motor that produces a constant torque at all speeds connected to a viscous friction damper that requires a driving torque proportional to speed. This damping effect although it reduces the amount of torque available at high speeds for acceleration of the load, tends to increase the stability of the system when this motor is used in a closed cycle servo. This discussion so far has neglected to consider the armature reaction of the motor or friction torque due to brushes and bearings. In a two pole motor, armature reaction flux will be roughly at right angles to the shunt field flux and its effect will be to reduce the output torque of the servomotor for high values of armature current. Armature reaction can be reduced by designing the motor to have high reluctance in the armature reaction axis or by the inclusion of compensating windings. The armature current is passed through these windings and they are oriented so the ampere turns produced cancels the ampere turns of the armature. Friction of the brushes and bearings will have a component proportional to speed, and a component that is invarient with speed. The first of these will merely change the slope of the curves of Fig. 2 slightly. The coulomb friction which is not dependent on speed may have a detrimental effect on servo performance and should be kept small. In a well-designed servomotor all friction will be quite small compared to the developed torque of the motor.

Examining this motor in the light of the factors determining the choice of a servomotor as discussed before, a serious disadvantage of this motor when used alone is apparent. This disadvantage is that nearly all of the power supplied to the motor must come from the control circuits. The physical limitation of wire size in the armature winding also requires that the power be supplied at a comparatively low impedance level. This means that thyratrons or a motor generator set are usually required to supply the armature. Both types of control have been used. Special types of motor generators for use with shunt motors will be discussed later. The shunt motor itself has a very small time delay since the inductance of the armature circuit is small and can be further reduced by the use of compensating windings. The torque-inertia ratio can be made very high because the control circuit can be made to supply a large amount of current under dynamic conditions to accelerate the motor rapidly. In many applications these transient currents can be several times the normal full load current of the motor. The shunt motor itself can generally be made quite compact for its power output, but as discussed above, the associated equipment is generally large and heavy.

If a shunt wound d-c motor has its armature current supplied from a constant current source, it can be used as a servomotor by providing controllable field current. The torque equation for this type of machine is

$$T_m = K I_f \quad (2)$$

where K again is a constant dependent on the construction of the motor. The developed torque is independent of the speed of the motor and results in a family of curves as shown in Fig. 3. If the armature current remains constant as was assumed for the curves of Fig. 3, the motor possesses no natural damping other than brush and bearing friction and when used in a servo some other means of damping must be provided. Generally this is not a great disadvantage since the amount of damping that must be provided to produce a high performance servomechanism is large compared to the natural damping of the motor. Motors designed for field control applications usually have a split field winding and there are two circuits commonly used to control this type of motor. One circuit uses thyratrons connected to the motor as in Fig. 4. In this circuit the motor fields are wound for the same current as the armature. The thyratrons are biased so that each tube conducts for about a quarter of a cycle. Application of control voltage to the grids of the thyratrons will increase the current through one tube and decrease the current through the other tube. The total current through the armature will remain constant and the net field excitation will cause the motor to rotate. This same type of circuit could be used with high speed relays in place of the thyratrons. The other control circuit commonly used with this motor is as shown in Fig. 5 and employs vacuum tubes to control fields that are wound for high impedance. The armature of the servomotor is supplied through a dropping resistor from a d-c supply. The current through the armature may be considered constant only so long as the generated emf of the motor is small compared to the armature supply voltage. In an actual servo

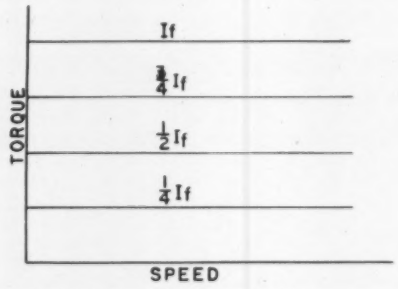


Fig. 3. D-c. motor field control torque-speed curves.

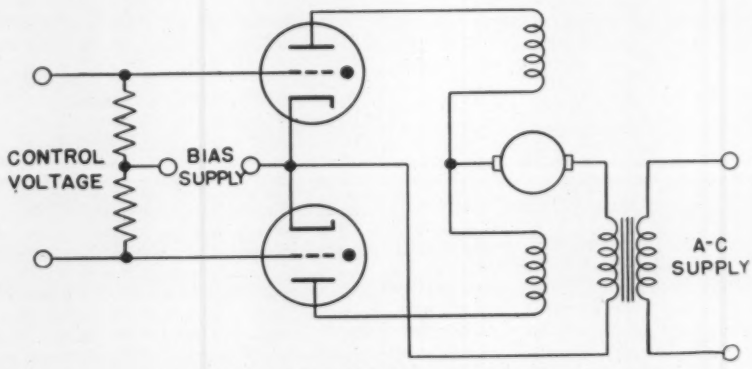


Fig. 4. D-c. field control circuit using thyratrons.

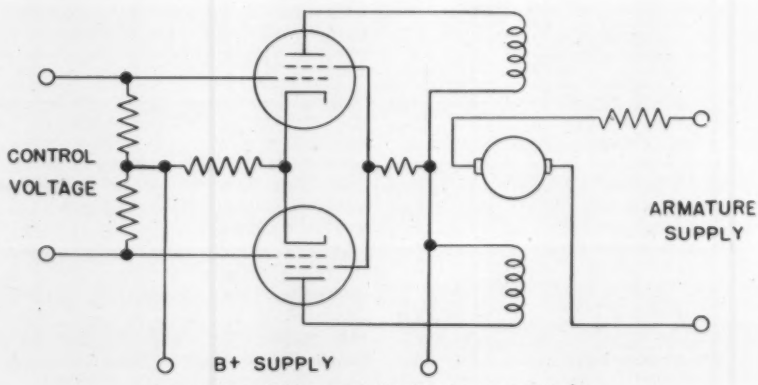


Fig. 5. D-c. field control circuit using vacuum tubes

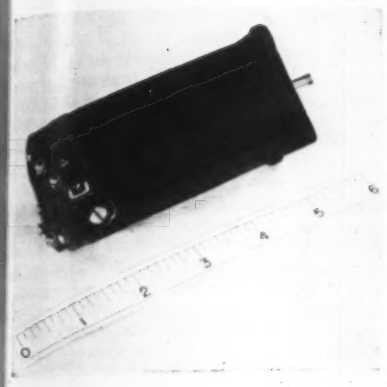


Fig. 6

application it is found that good control can be obtained at speeds which produce considerably reduced armature current. This is due partly to the fact that at high speeds the high accelerations called for are in such a direction as to slow the motor down, and as soon as the direction of the excitation reverses, the armature current immediately becomes larger than usual. The delay in this type of motor is due to the inductance of the field circuit and it generally can be made quite small by using beam power or pentode tubes in the control circuit. This type of control is relatively inefficient in that a large proportion of the armature supply power is dissipated in the external resistor, but this fact is outweighed in some applications by the small amount of equipment needed. A particular motor that has been developed for aircraft applications is shown in Fig. 6. This motor is designed to be operated by type 6AQ5 miniature vacuum tubes. Fig. 7 shows torque-speed curves for this motor. The motor shown has an alternating current tachometer generator built on the same shaft as the motor and included in the same case. This generator is used to furnish damping signals that are introduced as feedback in the amplifier circuit to stabilize the servomechanism.

There are two types of motor generator d-c servomotors which have been used considerably in the last few years. One of these uses a more or less conventional field controlled d-c generator to supply the armature of a separately excited shunt motor. The other uses a special generator called the amplidyne to drive a shunt motor. The first type mentioned is sometimes called a Ward-Leonard drive. A schematic of this type of drive is shown in Fig. 8. The generator is driven at a more or less constant speed by a separate motor. The fields of the generator are generally wound for high impedance so they can be controlled by a pair of vacuum tubes connected in push-pull. Both the generator and the output motor may have compensating windings to reduce the effect of armature reaction. The output motor has a separately excited field. The generator will have a generated voltage

$$E_g = K_g I_f$$

where K_g is a constant depending on the design of the machine and I_f is the net field current. This net field current is sometimes called the "difference current" and is the difference between the currents in the two halves of the field winding if the fields are excited by a push-pull vacuum tube stage. The generator terminal voltage

$$V_g = E_g - I_a R_g$$

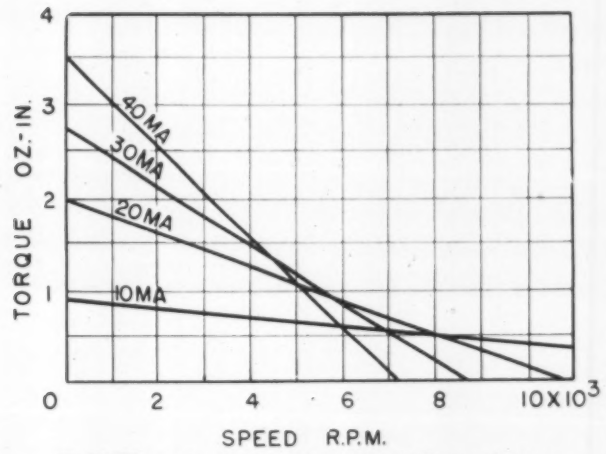


Fig. 7. Torque-speed curves. Small d-c. field control motor.

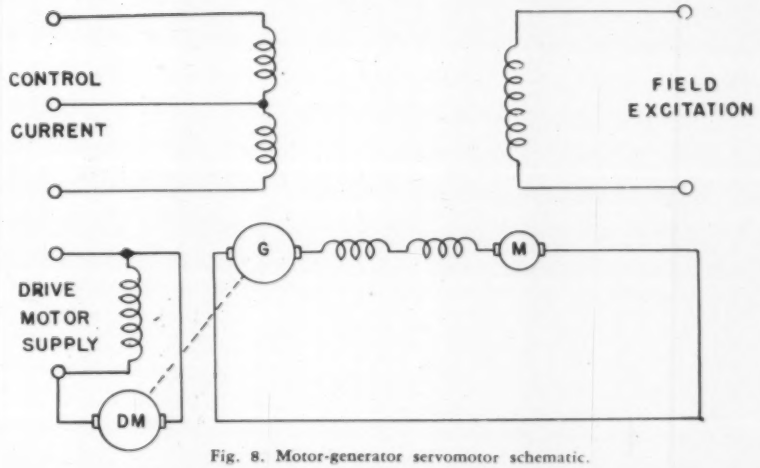


Fig. 8. Motor-generator servomotor schematic.

where I_a is the armature current and R_g is the generator resistance including any compensating fields that may be used. The equations for a separately excited shunt motor were shown in equation (1) as

$$T = \frac{(V_m - K_1 \Omega_m) K_2}{R_m}.$$

Since

$$V_g = V_m,$$

$$T = \frac{K_2}{R_g + R_f}(K_g I_f - K_2 \Omega_m.) \quad (3)$$

This equation leads to the family of torque-speed curves shown in Fig. 9. These curves are similar to the curves for a shunt motor and are subject to the same general comments. In an actual example this servomotor will tend to give somewhat reduced torque for high armature current due to armature reaction, and the spacing may not be quite uniform between the curves because of non-linearity in the magnetization curve for the generator. This type of servomotor can be used to produce a very high performance servomechanism. If the generator is designed to deliver large currents to the output motor for a short time very high accelerations can be obtained. There are two time delays between field voltage of the generator and build-up of torque in the output motor. One of these is due to the inductance of the control field of the generator. This delay can be minimized by the use of beam power or pentode tubes in the amplifier output stage just as in the field control motor. The magnitude of this delay will depend on the size of the machine but will generally be quite small for machines of under a half horsepower rating. The amount of power required to excite the generator field is within the capabilities of receiving type vacuum tubes for systems of under a half horsepower rating, but for larger machines transmitting tubes or some other means of control must be used. This type of servomotor is usually inefficient since the losses of three rotating machines are involved, the drive motor, the generator and the output motor. For some applications where several servos are involved, the efficiency can be increased considerably by using one drive motor to operate several generators. One such application is an automatic pilot for an airplane which requires servos for ailerons, rudder and

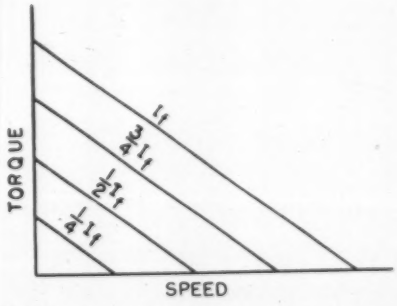


Fig. 9. D-c. motor generator servomotor torque-speed curves.

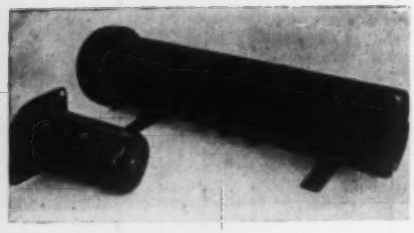


Fig. 10.

elevators. The photograph of Fig. 10 shows a three axis generator and output motor designed for use in an autopilot. The drive motor operates from the airplane d-c supply as do the fields of the output motors. Torque-speed curves for this servomotor are shown in Fig. 11. The maximum acceleration or torque-inertia ratio of this motor at stall is 25,000 radians per second per second. Weight of each output motor is 3 pounds 10 ounces. The power motor and three generators weigh 17 pounds 14 ounces.

The amplidyne type of motor generator shown schematically in Fig. 12, has built into it a stage of electromagnetic amplification. The control field is designed for use in the plate circuit of a push-pull vacuum tube amplifier as was the control field of the Ward Leonard generator. The flux produced by this field causes a circulating current in the quadrature axis of the machine since the brushes in this axis are short circuited. This quadrature axis current causes an armature reaction flux across the machine which generates a voltage appearing across the direct axis brushes. These brushes are connected to the load circuit through a compensating field which exactly counteracts the armature reaction flux of the direct axis which would otherwise reduce the control field flux. The voltage generated in the quadrature axis

$$E_q = K_q I_f$$

where K_q is a constant of the machine and I_f is the difference current in the control field. Since the brushes of the quadrature axis are shorted, the current in this axis will be

$$I_q = \frac{K_q I_f}{R_q}$$

where R_q is the total resistance of the quadrature circuit. The direct axis generated voltage will be

$$E_d = \frac{K_q K_d I_f}{R_q}$$

where K_d is the direct axis machine constant. The terminal voltage in the direct axis will be

$$V_d = \frac{K_q K_d I_f - I_a R_d}{R_q}$$

where I_a is the current in the direct axis and R_d is the direct axis resistance including the compensating field. If a separately excited shunt motor is used as shown in Fig. 13, the same shunt motor equation applies

$$T = \frac{(V_m - K_1 \Omega_m) K_2}{R_m}$$

Since

$$V_m = V_d$$

$$T = \frac{K_2}{R_d + R_m} \frac{(K_q K_d I_f - K_1 \Omega_m)}{R_q} \quad (4)$$

This equation results in a family of torque-speed curves that are similar to those for the shunt motor and for the Ward Leonard drive. These curves are shown in Fig. 13. The amplidyne has three time delays, the control field, the quadrature axis and the direct axis. Usually the direct axis delay is very small and the quadrature axis delay is the greatest. This delay is appreciable since the brushes are shorted in this axis and the ratio of inductance to resistance is relatively large. The principal advantage of the amplidyne lies in that the electromagnetic amplification obtained allows the machine to be controlled with a very small amount of power in the control fields. This permits amplidynes to be used as servomotors well up into the integral horsepower range.

A-C Servomotors

The most commonly used type of a-c. servomotor is the two phase induction motor. This type of motor is shown schematically in Fig. 14. If two alternating voltages differing in phase by 90° are applied to the two windings of the motor, a rotating magnetic field is produced. The armature of this motor has a short circuited winding in which currents are induced. A torque is produced that tends to rotate the armature in the direction in which the magnetic field is rotating. The amount of torque produced for a given excitation depends on the design constants of the motor and on the difference in speed of rotation of the magnetic field and the armature. The currents induced in the armature will be of a frequency that is proportional to this speed difference. The torque will be zero at the speed of rotation of the magnetic field or synchronous speed and will increase as the speed is reduced until a maximum torque is

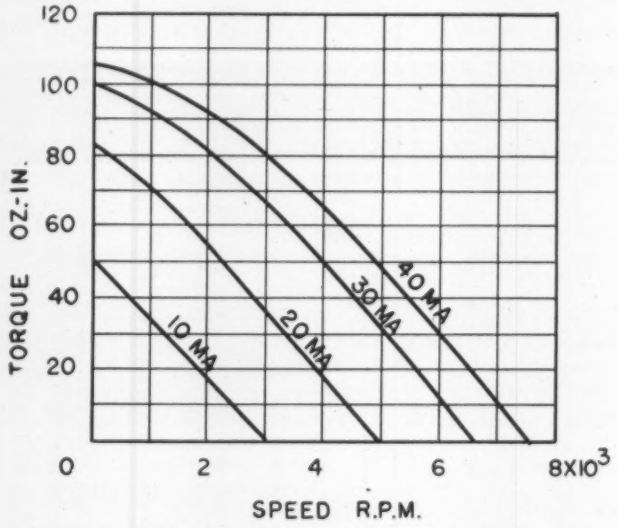


Fig. 11. Autopilot motor-generator servometer torque-speed curves.

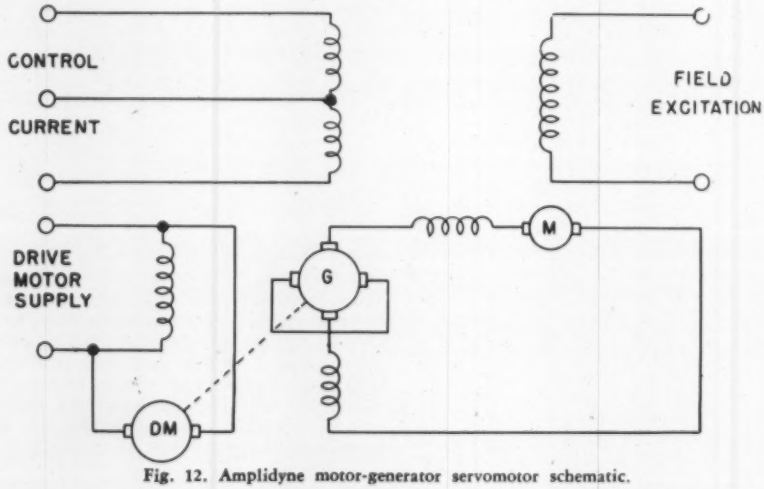


Fig. 12. Amplidyne motor-generator servomotor schematic.

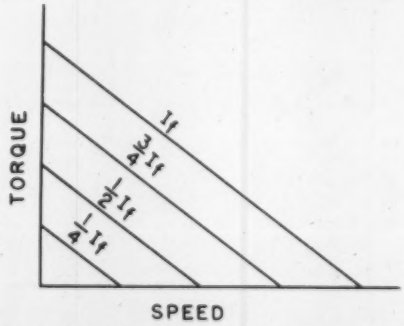


Fig. 13. Amplidyne motor-generator servomotor torque-speed curves.

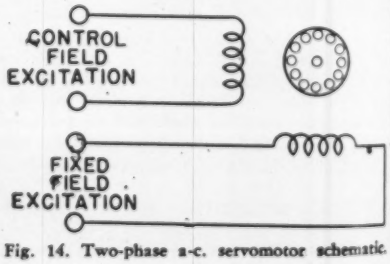


Fig. 14. Two-phase a-c. servomotor schematic.

reached. This maximum occurs approximately when the armature resistance and reactance are equal. This means that other things being equal, an armature wound with low resistance wire will have its maximum torque near synchronous speed, while a high resistance armature will produce peak torque at a much lower or in some cases negative speed. For servo applications, the winding resistance is usually chosen so that maximum torque occurs near zero speed. The type of armature used in most servomotors is of the die cast squirrel-cage type. If the voltage across one of the stator windings is held constant and the other voltage varied in magnitude the torque output of the motor will vary. If the phase of the variable voltage is reversed, the direction of the torque produced will be reversed.

A family of torque-speed curves for this type of motor is shown in Fig. 15. These curves can be approximated by the equation

$$T = (K_1 V_c - K_2 \Omega_m) V_f \qquad (5)$$

where V_c and V_f are the voltages on the control field and the fixed field respectively and K_1 and K_2 are constants of

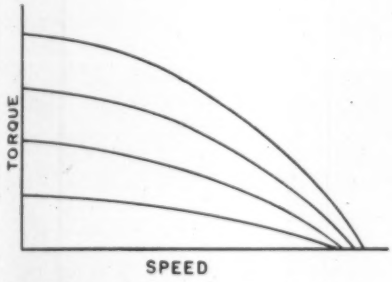


Fig. 15. Torque-speed curves. Two-phase a-c. servomotor.

the machine. Usually the fixed field voltage is held constant and the control field voltage is varied by the use of a vacuum tube amplifier. The vacuum tube amplifier usually consists of a pair of power tubes operated in push-pull and coupled to the motor winding through an output transformer. The fixed phase of the motor can be excited either from the a-c line or through a network which shifts the phase of the voltage applied to the field. It must be remembered that voltages applied to the two windings of the motor must be approximately 90° different in phase, so if the fixed phase is excited from the a-c line, the amplifier must be designed so that its output voltage is 90° out of phase with the line. Usually this is easy to do since the data system will generally have some phase shift and it is comparatively easy to add additional phase shift of the error signal in the amplifier. In actual use, the torque-speed curves of the motor will depend somewhat on the circuit used to drive the motor since the impedance of the motor will change with speed. This type of motor requires that a fairly large portion of the total motor input power be supplied by the control field. The ratio of fixed field power to control field power is generally not greater than three to one for good servo performance. In small servos of this type the maximum control field is often greater than the fixed field power in order to reduce the heating of the motor under steady state conditions, but

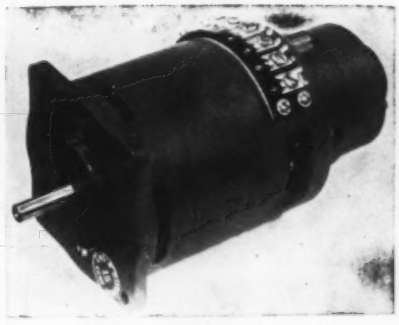


Fig. 16.

still allow high peak power for transient loads. The torque inertia ratio of the two phase motor can be made quite good in the small sizes, and the delay in the control field excitation is very small if the field is not resonated. The proper value of condenser placed from plate to plate of the output stage will resonate the field of the motor at the supply frequency and will increase the maximum power output of the amplifier, but will introduce a delay which may be significant. Induction motors can be designed for either 60 or 400 cps and find use both in ground and aircraft work. Limitations on the size of the amplifier generally limit their usefulness to servos rated at less than one tenth horsepower although larger motors have been used with thyratron control circuits.

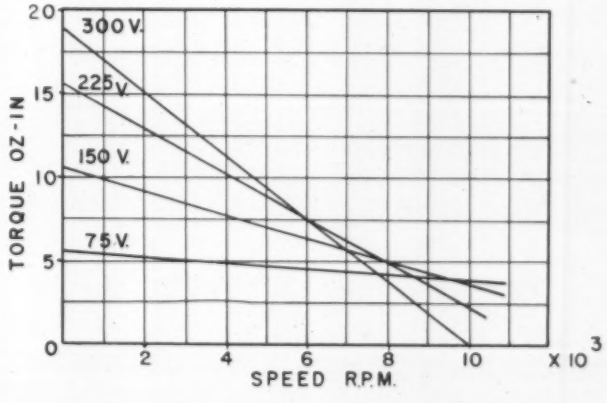


Fig. 17. Torque-speed curves. A-c. field control servomotor.

The field control shunt motor discussed earlier for operation on direct current can also be used on alternating current if proper precautions are taken in the design of the motor and of the control circuits. For a-c operation, it is desirable to make the field structure of laminations to reduce eddy current losses. The general family of torque-speed curves for the d-c motor shown in Fig. 3 apply equally well to the a-c motor. For a-c operation the output stage shown in Fig. 6 becomes an a-c amplifier and the armature is excited from an a-c line. The fields may be resonated as in the case of the induction motor by the addition of the proper value of condenser from plate to plate of the output stage. It will be noted that if one of the brushes of the motor bridges from one commutator bar to the next, one coil of the armature is short circuited and the coil is in a plane to have maximum flux linkage with the control field. A current is inducted in this short circuited coil that does not produce torque but does require additional power input to the control field and increases armature heating. This effect can be minimized by using a large number of commutator segments and by the use of high resistance brushes to limit the current flow in the short circuited coil. This type of motor requires a relatively large iron structure for both the stator and the rotor and therefore generally has a poor torque-inertia ratio. The delays in the motor are small unless the field is resonated. It is unlikely that this type of motor could be used very successfully at frequencies higher than 60 cps because of the high iron loss at higher frequencies. A typical motor of this type is shown in the photograph of Fig. 16. Torque-speed curves for this motor are shown in Fig. 17.

Conclusion

The servomotors discussed above are the types of electric servomotors most commonly used for mechanical rotation servomechanisms. Other types of electric servomotors have been used for applications requiring special characteristics. There have also been some types of electric motors that have been used as servomotors during the development of the servomechanism art that are not widely used for present day applications. A discussion of all these types is beyond the scope of this paper. There is also a complete field of non-electric servomotors such as hydraulic and pneumatic systems that have not been discussed here.

The servomotors discussed in this paper have been examined in the light of the steady-state torque speed curves as measured on the output shaft for various values of the input or control quantity. The relative merits of other factors determining the choice of a servomotor for a particular application have been pointed out for each type of servomotor. In order to apply the above data for actual servo calculations, it is necessary to know the characteristics of the load as well as the characteristics of the servomotor because both will enter into the differential equations determining stability and performance of the complete servomechanism.

SECTION SECRETARIES AND MEETING DATA

	Telephone	Date	Dinner	Meeti
Akron: Fred Appel, 932 Columbia Ct., Barberton, Ohio.				
Aruba: M. R. Holly, P. O. Box 389, c/o Lago Oil & Transport Co., Ltd., Aruba, N.W.I.		1 Tues.	X	7:00
Atlanta: Emory W. Clark, P. O. 819, Atlanta, Ga.				
Baltimore: Felix Cox, Bethlehem Steel Co., Sparrows Point, Md.		2 Fri.		
Boston: C. J. Nazzaro, 456 Central Avenue, Milton 87, Mass.				
California: D. D. Taylor, 234 E. Colorado, Pasadena 1, Calif.		1 Tues.	6:45	
Central Illinois: T. A. Carroll, 721 Hurlburt St., Peoria, Ill.				
Central Indiana: M. Underwood, 1235 W. 33rd St., Indianapolis, Ind.		1 Tues.	X	7:30
Charleston: W. E. Warner, Rt. #3, Box 274, Charleston, W. Va.		1 Mon.	X	8:00
Chicago: Floyd E. Erstman, 506 S. Wabash Avenue, Rm. 611, Chicago 5, Ill.		1 Mon.	6:30	8:00
Cincinnati: Smith Hickenlooper, 1147 Beverly Hills Dr., Cincinnati, Ohio.		4 Mon.		
Cleveland: L. W. Waldrip, 3030 Euclid Ave., Cleveland, Ohio.		4 Wed.	6:30	8:00
Cumberland: Clyde Babst, P. O. Box 447, Cumberland, Md.		*Tues. after 4 Mon.*	6:30	8:00
Detroit: T. S. Cawthorne, 570 Maccabees Bldg., Detroit 2, Mich.		3 Tues.		
Eastern New York: Wm. J. Claffie, Winthrop Chemical Co., 33 Riverside Ave., Rensselaer, N. Y.		1 Tues.	6:30	
Gulf Coast: A. E. Bunn, 2237 North Street, Beaumont, Texas.		3 Tues.		
Houston: E. E. Kleir, 2510 S. Blvd., Houston 6, Texas.		Last Mon.	X	8:00
Kansas City: W. J. Blackburn, 1621 E. 31st St., Kansas City, Mo.		Last Tues.	6:30	7:30
Louisville: Paul B. Smith, 3016 Beaumont Road, Lousville, Ky.		Last Tues.	X	8:00
Montreal: F. S. McCarthy, Canadian Industries, Ltd., Box 10, Montreal, Quebec, Canada.				
New Jersey: W. D. Archibald, 605 Westminster Ave., Elizabeth 3, N. J.		1 Tues.	6:00	
New Orleans: W. H. Haney, 2927 Music Avenue, New Orleans, La.		*No Regular Date*		8:00
New York: C. E. Haggerty, 7552 181st St., Flushing, L. I., N. Y.		Last Mon.	6:30	8:00
Niagara Frontier: K. J. Fees, 669 Ashland Avenue, Niagara Falls, N. Y.		4 Mon.	X	8:00
Northern Indiana: C. P. Haynes, 935 177th Place, Hammond, Indiana.		3 Wed.	6:30	7:30
Oak Ridge: J. O. Alexander, 101 Hoyt Lane, Oak Ridge, Tenn.		1 Wed.	7:00	
Ontario: A. J. Legault, Bristol Co. of Canada, Ltd., Toronto, Ontario, Canada.		3 Thur.	6:45	
Philadelphia: C. W. Wood, 6908 Market St., Upper Darby, Pa.		3 Wed.	X	
Pittsburgh: L. M. Susany, c/o Carnegie Institute, 4400 Forbes St., Pittsburgh 13, Pa.		4 Mon.	6:30	8:00
Presque Isle: R. P. Marshall, 161 W. Main St., North East, Penna.		4 Tues.	X	8:00
Richland: R. S. Hammond, 402 Abbott, Richland. Washington.		2 Wed.	X	7:30
Rochester: R. C. Swartz, Jr., 1201 Granite Bldg., Rochester 4, New York.		3 Tues.	X	8:00
St. Louis: W. G. Lee, 4710 Delor St., St. Louis 16, Mo.		1 Wed.	X	8:00
Sarnia: C. G. Elder, 314 Maria St., Sarnia, Ont., Canada.		2 Fri.	X	
South Bend: Charles E. Williams, 921 Lawndale Avenue, South Bend, Ind.		1 Thur.	6:30	7:30
South Michigan: Homer Kuiper, 2517 Hillsdale, Kalamazoo, Mich.		2 Wed.	6:30	8:00
South Texas: H. C. Givens, La Gloria Corp., P. O. 637 Falfurrias, Texas.		1 Tues.	X	7:30
Tennessee: L. W. Thayer, 1229 Bristol Highway, Kingsport, Tenn.		*No Definite Night*	7:00	8:00
Tulsa: C. R. Horton, 8211 E. 7th, Tulsa, Oklahoma.		1 Mon.	X	7:30
Twin Cities: Ray Hooper, International Div. Minneapolis-Honeywell Reg. Co., 2753 Fourth Ave., Minneapolis 8, Minn.		4 Tues.	6:30	
Washington: G. M. Rolls, c/o American Instrument Co., 8010-20 Georgia Avenue, Silver Spring, Md.		3 Mon.	X	7:30
Wayne County: R. L. Swenson, 1569 13th St., Wyandotte, Michigan.		3 Mon.	6:30	8:00

(Continued from page 1136)

Who's Who in ISA

LYMAN H. ALLEN, JR.

Member, ISA Executive Committee and Philadelphia Section Executive Committee

Mr. Lyman H. Allen, Jr., graduated from Massachusetts Institute of Technology in 1934. He was employed by Vulcan Copper and Supply Co., Cincinnati, from 1934 to 1938 and was Staff Engineer, American Viscose Corporation at Meadville, Pa. Plant from 1938 to 1944. From 1944 to the present, he has been Assistant Chief Design Engineer, in Charge of all Chemical Process Design, Corporation Engineering Department, American Viscose Corporation, Philadelphia. He is an active member of AICHE, ASME and ISA. In ASME, he is a member of Instrument Application Committee. In ISA, besides his other duties he is Chairman of the Technical Papers Sub-Committee. He is the author of three papers,

"Industrial Control Instrument Settings"—"I & EC" December 1943

"Automatic Control Instrument Adjustment"—"I & EC" August 1944

"Experimental Studies in Fractionating Column Control"—ASME Preprint 1945.

I. S. A. EMPLOYMENT SECTION

Forward your letter to INSTRUMENT SOCIETY OF AMERICA, 1117 Wolfendale St., Pittsburgh 12, Pa.

INSTRUMENT ENGINEER with considerable experience with electronic and air operated controllers; also measuring, indicating and recording instruments for temperature, pressure, flow, pH, etc. Would be expected to prepare specifications, work with draftsmen in preparation of instrument arrangement, make field investigation. At least three years practical experience required. Location New Jersey. Box 207.

. . .

INSTRUMENT SALES REPRESENTATION. Manufacturer entering instrument field with new non-competitive line of pneumatic instruments desires sales representation on a commission basis. Established sales agencies are invited to submit inquiry for open territory. Please include territory covered, number of personnel and accounts handled. Box 208.

. . .

INSTRUMENT ENGINEER Graduate Chemical, Electrical or Mechanical Engineer with two or more years experience in the selection, installation, maintenance and repair of chemical process instruments and controls. Completion of training in organized instrumentation department considered equal to actual experience. Opportunity to head new department. Give full resume and salary required in first letter. Location New Jersey. Box 209.

Statistics on the Employment Register are as follows:

Positions posted on Bulletin Board	87
Instrument Engineers Applications on file	99
Instrument Mechanics Applications on file	121
New members joined Society, so as to participate in the benefits of the Employment Register	5
Employers who "combed" the files of applicants	65
Number of men who looked over the listing of open jobs, and who took notes for contacting, etc.	1200 to 1400
Positions filled at the time of the Convention	2

THE 1948
Instruments Index
EXTRA ISSUE OF *Instruments* THE MAGAZINE OF *Measurement and Control*

nstruments Publishing Company, Pittsburgh 12, Penna.

Maybe it's time to listen to your Instrument Man

HOW can you meet competition when labor and material costs are sky high? Only by increasing production efficiency. And probably the man to talk to about this is your own Instrument Engineer!

In fact it's a rare process, whether it involves temperature, pressure, humidity, flow, or liquid level, that can't benefit by the application of new indicating, recording, or controlling instruments.

Here is what modern instrumentation can do:

1. Increase productivity of labor. Operators *prefer* instruments because:

(a) They are relieved of responsibility for maintaining product quality.

(b) They are freed from the drudgery of hand operation and have more time to use their skills on other problems.

(c) Instruments make their jobs safer.

(d) Operators can earn more because instruments turn out a better, more uniform product with less waste.

2. Enable you to meet competition with higher, more uniform quality at minimum cost. When instruments take over, every step is the same every time—until your process engineers decide to change it.

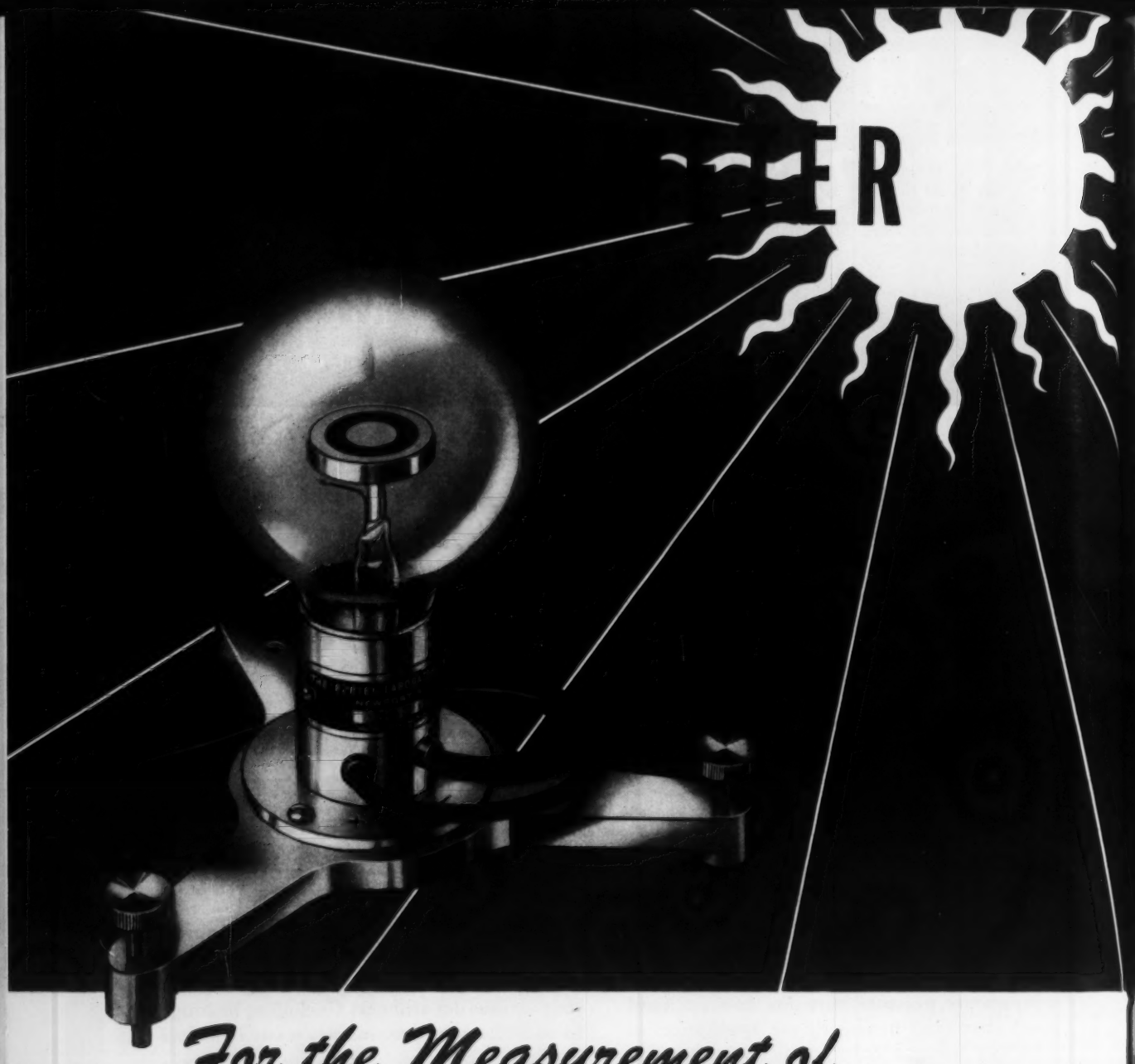
3. Give you more accurate cost figures. With a flowmeter, for example, you can tell exactly how much steam to charge against your various departments (including heating). In addition, it helps minimize waste by detecting faulty operation of traps and valves.

4. Give you better coordination of temperatures, pressures and other variables so that processing can be carried on with ever-increasing efficiency.

Taylor Instruments have served industry for many years. The name Taylor means accuracy of control, dependability, simplicity of operation, and ease of maintenance. Experienced Taylor Field Engineers are located in or near all industrial centers in the U. S. and Canada. Complete repair service is maintained at Rochester, Tulsa, San Francisco and Toronto.

May we hear from you? Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ontario.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST



For the Measurement of
SOLAR RADIATION

Eppley pyrheliometers are in use measuring solar radiation at twenty-six out of twenty-seven weather stations in the United States, ten of these stations being under the direction of the United States Weather Bureau.

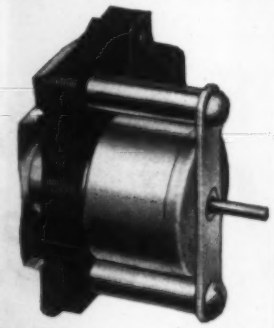
To industry they are an invaluable aid in the testing of paints, finishes, textiles, etc. for sunfastness.

In agriculture, the Eppley Pyrheliometer enables one to employ the most accurate and reliable method of arriving at the amount of radiation received by crops.

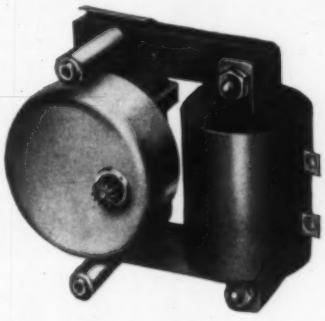
Bulletin No. 2 On Request

THE EPPLEY LABORATORY, INC.

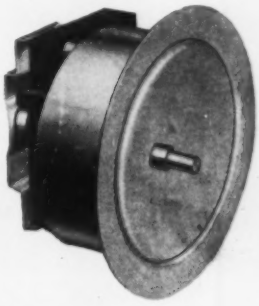
NEWPORT — RHODE ISLAND — U. S. A.



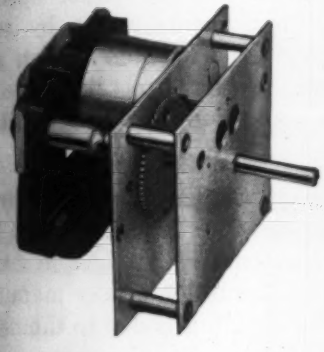
One of several light and medium-duty B type synchronous motors for timing, switching, control and recording applications. Torque rating .020 to .375 pound-inches at 1 rpm.; .004 to .015 at 60 rpm. Available in reversible and explosion-proof models. Standard terminal shaft speeds are 1 and 60 rpm. Other speeds available.



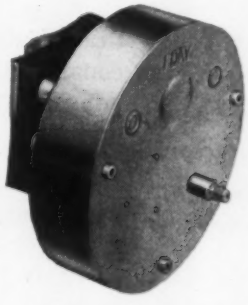
Typical H model for light and medium duty. Torque rating.018 pound-inches at 3.6 rpm. to .50 pound-inches at 1 rph. Terminal shaft speeds 3.6 rpm. to 1 rph.



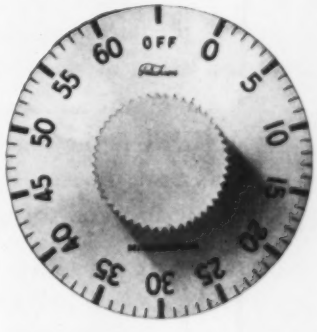
Typical C motor, with sturdy gear train construction, for heavy-duty timing, switching and control devices. Torque rating 1 to 2 pound-inches at 1 rpm. Standard terminal shaft speed 1 rpm. Other speeds available. Also available in reversible and explosion-proof types.



IM-8 Instrument Movement. Small, compact movement for light-duty applications. With or without ratchet gear for resetting in clockwise direction. Powered with H or B motor. Terminal shaft speeds 12 rph. to 1 revolution in 24 hours.



IM-9 Instrument Movement. Has totally enclosed circular gear train. Adaptable to most instruments, especially chart drives. Has special back-lash eliminators. Counter-clockwise rotation standard. Can be furnished with B type explosion-proof motor. Shaft speeds 4 rph. to 1 revolution in 30 days.



E-10 Minitmaster. Timer with a strong, continuous audible warning signal. Timing up to 60 minutes. Supplied without plastic dial. Also available with 15-amp. switch and round front plate.

Trust an instrument with a dependable Telechron motor

Telechron synchronous electric motors are engineered to meet the most exacting demands of automatic timing, control, switching, and recording instruments. Precision building assures the accuracy so vital in automatic operations. Telechron's capillary oiling system and high-speed rotor make these self-starting motors thoroughly reliable . . . and long-lived.

Telechron motors give long and dependable service in many kinds of automatic industrial applications. There are types and designs to meet customers' specifications in the following fields:

Timing	Switching	Measuring
Controlling	Cycling Operations	Gaging
Metering	Signaling	Regulation
Recording	Fixed Process Controlling	Communications

The replaceable rotor unit of the Telechron motor is sealed to give dust-free operation and controlled lubrication. Externally mounted coils provide ventilated operation. There's a wide range of terminal-shaft speeds, voltages, frequencies, and torque ratings. *Torque ratings are conservative.* Motors are available for 12 to 250 volt operation on all commercial frequencies.

Telechron is the oldest and largest manufacturer of synchronous timing motors. Its experienced *application engineers* have found the answers to many difficult and complex installation questions. They're always glad to study the motor applications of any timing, control, switching, or recording instrument manufacturer . . . and make sound recommendations. There's no obligation. Just address Industrial Sales Division.

Telechron
REG. U.S. PAT. OFF.
SYNCHRONOUS MOTORS

TELECHRON INC. • ASHLAND, MASSACHUSETTS

The 1948 Instruments Index

THIS issue of the INDEX has been compiled to meet the need of users of instruments and devices for measurement, inspection, testing and control, for a purchasing directory of such equipment. Since the 1947 INDEX, 187 companies' names and products, which have not appeared previously, were included; the names of 143 companies appearing in former issues of the INDEX have been removed; 384 name and address changes have been made. The INDEX is the most complete directory of instruments and devices for measurement, inspection, testing and control ever published.

This directory is arranged, indexed and cross-indexed to make its contents easily available.

The Index Section—"Who makes what"—is the most important. Anyone who wants to know where he can buy or secure information on a certain product will find the product properly indexed and cross-indexed, and under it the names of the manufacturers of this equipment and manufacturers' sole representatives.

Indexing System. Products are indexed under the main word. In cases where a name is ambiguous, or where the item is known under two or more names, companies making such devices are listed under one heading and cross-references inserted under the other headings.

Specific Terms. You never are in need of "a gage" but of some particular kind of gage. Therefore we do not list manufacturers under broad general designations. For example, we do not list any names under the main heading "Meters" but we give the sources of supply for numerous classes and types of meters. Moreover, we do not list any names under "Meters, Liquid" alone, but we give under proper subheads the sources of supply for the *class* and *type* of liquid meter you may need.

Correctness of Headings. As explained above, main headings and subheads are technically correct. A few are not scientifically correct: they are names in common usage, recognized for the convenience of the majority.

Correctness of Listings. A few of the compani listed and advertising in the INDEX you alrea know. All of them are actively engaged in t manufacture of instruments and devices for mea urement, inspection, testing and control. We ha endeavored to list no firm names under speci headings unless the instruments made by su firms belong there by virtue of their design a construction. As a rule, we have to take the co pany's word that it could supply the product question.

Completeness. More than 1200 manufacture were canvassed in the last four months. In the l few weeks we sent representatives to call on man facturers. Therefore, the omission of any manufa turer's name under any heading is due to the neg gence of someone in his own organization.

Every effort has been made to restrict the names in Index Section to (1) the actual manufacturers and (2) sole authorized sales agencies. On the other hand, wh ever you desire to order at one time a variety of equipme made by different firms, you may find it most convenient get in touch with a recognized, competent, "laboratory s ply house." These houses are listed under "*Apparatus, L oratory,*" on page 16.

Instruments' Further Service. This Index contains the swers to *only* 99% of your inquiries. If you cannot the product or the name you want, communicate with Information Section, Instruments Publishing Co., Wolfendale St., Pittsburgh 12, and every effort will be m to furnish the information promptly.

Suggestions. We shall appreciate suggestions regarding

1. Headings not at present found in this Index which sho be there,
2. Firms listed erroneously, and
3. Other inaccuracies which may have crept in despite precautions.

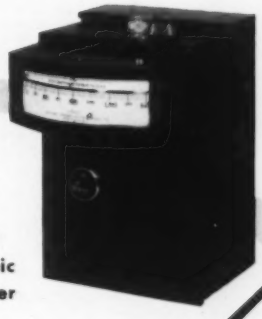
Use this INDEX consistently. You will find companies listed herein equipped to render kind of service which saves time and helps ma satisfied customers.

Where companies in whose products you are terested have omitted descriptions, your cooper tion is invited in bringing this to the attention the supplier or the publisher. Also, whenever INDEX has aided you, please inform the manufa turer that his data in THE INSTRUMENTS IND were of help to you.

precision instruments

. . . with exclusive *Alnor* advantages . . .

Alnor Wall-Panel Pyrometers



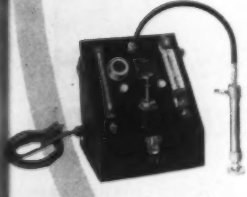
Alnor Electronic Controller

Alnor Pyro Lance

Alnor Pyrocon

Accuracy . . . fast indications . . . ruggedness . . . these are built-in advantages that you get with any Alnor instrument—advantages equally important in the laboratory or on the production line.

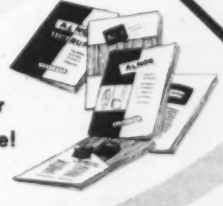
For temperature, air-velocity and dew point measurement work, there is an Alnor instrument—plus a wealth of Alnor experience—to help you. Ask to have an Alnor representative call on you and show you how to gain these advantages.



Alnor Dewpointer

Alnor Distant Reading Electrical Thermometers

Alnor Velometer



Send for Literature!

Attractive, informative, descriptive literature is available on all Alnor instruments. Send for copies covering the instruments in which you're interested. Address Illinois Testing Laboratories, Inc., Rm. 537, 420 N. LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

INDEX SECTION

ABRASION MACHINES (See Testers, Abrasion)

ABSOLUTE PRESSURE INDICATORS (See Gages, Absolute Pressure)

ABSORPTIOMETERS
Biddle Co.
Brabender Corp.
Jarrel-Ash
Photovolt Corp.

ACCELEROMETERS
Alpha Instrument Co.
Autoflight Insts. Div.
Avion Instrument
Baldwin Locomotive
Brush Development Co.
Cambridge Inst. Co.
Commercial Research
Consolidated Engg.
Cook Electric
Cramer & Co., Inc.
Eclipse-Pioneer Div.
General Elec. Co.
Hastings Inst. Co.
Hathaway Inst. Co.
Heiland Research
Impact Register
Kollsman Inst. Div.
Schaevitz Engineering
Schottland, Frederic D.
Statham Labs.
Sylvania Elec. Prods.
Thwing-Albert Inst. Co.
Trimount Inst. Co.
Van Dyke Instruments
Waugh Labs.

ACCELEROMETERS, Torsional
Commercial Research
Hathaway Inst. Co.
Statham Labs.

ACIDIMETERS
Freas Glass Works
Heilige, Inc.
Henszey Co.
Macbeth Corp.
National Tech. Labs.
Rieker Inst. Co.
Rubicon Co.
Ruehfel Co.
Tagliabue Div.
Taylor & Co., W. A.
Thwing-Albert Inst. Co.
Uehling Instrument Co.

ACOUSTIMETERS (See Sound Level Meters)

ACTUATORS, Hydraulic
Autoflight Insts. Div.
Automatic Products
Eclipse-Pioneer Div.
Hagan Corp.
Hammel-Dahl Co.
Hydraulic Controls
Inflico Inc.
Leupold & Stevens
Martin-Hubbard Corp.
Republic Flow Meters

AEROGRAPHS
Aerological Developments
Eclipse-Pioneer Div.
Fuess, Inc.

AEROMETERS
Avion Instruments
Friez & Sons

AIR ANALYSIS APPARATUS (See Gas Analyzers, Air)

AIR VELOCITY METERS
Baldwin Locomotive
Hastings Inst. Co.
Illinois Testing Labs.
Westberg Mfg. Co.

AIRCRAFT FLIGHT ANALYZERS
Autoflight Insts. Div.
Electronic Associates
Hathaway Instrument
Impact Register
Waugh Labs.

AIRCRAFT INSTRUMENT TOOLS
Airdraulics Engineering
General Elec. Co.
Ideal Lab. Tool
Marshall Co.
North Amer. Inst. Co.
Sperry Gyroscope Co.

AIRCRAFT NAVIGATIONAL INSTRUMENTS
Autoflight Inst. Div.
Avion Instruments
Bausch & Lomb Opt.
Boes Co., W. W.
Collins Radio Co.
Cook Electric
De Jur-Amsco
Eclipse-Pioneer Div.
Electronic Associates
Elgin National Watch
Fecker, Inc.
Federal Telegraph
Fischer & Porter
Fuess, Inc.
(Cont'd)

AIRCRAFT NAVIGATIONAL INSTRUMENTS (Cont'd)
General Elec. Co.
Gurley, W. & L. E.
Harvey-Well Electronics
Hastings Inst. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Impact Register
Jaeger Watch Co.
Kenyon Instrument
Kollsman Inst. Div.
Link Aviation Devices
Machlett & Son
Manning, Maxwell & Moore
Martin-Hubbard Corp.
Modern Products Dev.
Moisture Register Co.
National Co.
Rad.o Receptor Co.
RCA Div.
Rieker Inst. Co.
Roller-Smith Co.
Schwien Engg. Co.
Simmonds Accessories
Sperry Gyroscope Co.
Summers Gyroscope Co.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Varo Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Carl Zeiss, Inc.

AIRCRAFT POWER PLANT INSTRUMENTS
Anderson Co.
Associated Research, Inc.
Beck Bros.
Bowser & Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Eclipse-Pioneer Div.
Edison Electric Controls
Electro Products Labs.
Federal Telegraph Co.
General Elec. Co.
Hays Corp.
Jaeger Watch Co.
Kenyon Instrument Co.
Kollsman Inst. Div.
Lewis Engg. Co.
Manning, Maxwell, Moore
Modern Product Dev.
Moisture Register Co.
Revere Corp.
Rieker Inst. Co.
(Cont'd)

AIRCRAFT POWER PLANT INSTRUMENTS (Cont'd)
Roller-Smith Co.
Sperry Gyroscope Co.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
U S Gauge
U. S. Taximeter
Varo Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

AIR DISTANCE, Indicators & Recorders
Avion Instrument
Collins Radio Co.
Eclipse-Pioneer Div.
Electronic Associates
Hastings Inst. Co.
Jaeger Watch Co.
Simplex Valve & Meter

AIR FLOW METERS (See Flowmeters, Gas)

AIR METERS (See Gas Meters, Positive)

AIRPLANE CONTROLS MOVEMENT RECORDERS
Autoflight Insts. Div.
Cook Elec.
Eclipse-Pioneer Div.
General Elec. Co.
Hathaway Instrument
Kollsman instrument
North Amer. Inst. Co.
Revere Corp.
Sound Apparatus

AIRSPEED INDICATORS (See also Aircraft)
Avion Instrument
Baldwin Locomotive
Cook Electric
Eclipse-Pioneer Div.
Fuess, Inc.
General Elec. Co.
Hastings Inst. Co.
Hathaway Instrument
Illinois Testing Labs.
Impact Register (Recorders)
Jaeger Watch Co.
Kollsman Inst. Div.
Meriam Co.
Schwien Engg. Co.
Waugh Labs.
U. S. Gauge Co.
Zernickow Co.

AIRSPEED INDICATOR TESTERS
Amthor Test. Inst. Co.
Baldwin Locomotive
Hathaway Instrument
Ideal Lab. Tool
Jaeger Watch Co.
Meriam Inst. Co.
Trimount Inst. Co.
Wallace & Tiernan

ALARMS, Bearing Temperature
Edison, Inc., Thomas A.
Powers Regulator

ALARMS, Carbon Bisulphide
Baird Associates

ALARMS, Carbon Monoxide, Combustible Gas, etc.
Baird Associates
General Elec. Co.
Johnson-Williams
Mine Safety Appliances
Wheelco Insts. Co.

ALARMS, High, low water (See Alarms, Liquid Level)

ALARMS, Hydrogen Sulphide
Baird Associates
Johnson-Williams, Ltd.

ALARMS, Inflammable Gas
Bristol Co.
Davis Emergency Equip.
Engineering Labs., Inc
Johnson-Williams, Ltd.
Leeds & Northrup Co.
Mine Safety Appliances
Viking Instruments, Inc.
Wheelco Instruments Co.

ALARMS, Liquid Level
Autocall Co.
Automatic Control Co.
Bailey Meter Co.
Bin-Dicator Co.
Boston Auto Gage Co.
Bristol Co.
Brown Inst. Co.
B.W. Controller
Campbell Co., J. A.
Cook Electric
Cutler-Hammer, Inc.
Eclipse-Pioneer Div.
Electronic Prod. Co.
(Cont'd)

ALARMS, Liquid Level (Cont'd)
Fischer & P...
Foxboro Co.
Hagan Corp.
Hays Corp.
Inferno Co.
Jerguson Gage & Valve
Kiely & Muel..., Inc.
L. A. B. Cor...
Leupold & St...s
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Merco.d Corp.
Minneapolis-Honeywell
Moore Products
Northern Equip. Co.
Panellet, Inc.
Petrometer Co.
Photoswitch, Inc.
Positel Mfg. Co.
Reliance Gauge Colum...
Republic Flow Meters Co.
Schade Valve Mfg. Co.
Shallcross Controls
Tagliabue Div.
Taylor Instrument Cos.
Trimont Inst. Co.
Uehling Instrument
U. S. Gauge
Warrick Co.
Water Level Controls
Wheelco Instruments Co.
Wright-Austin Co.
Yarnall-Waring Co.

ALARMS, SMOKE (See Smoke Density Indicators)

ALIDADES (See Surveying Instruments)

ALKALIMETERS
Ace Glass Inc.
Central Scientific Co.
Fisher Scientific Co.
General Elec. Co.
Heilige, Inc.
Kimble Glass Co.
National Tech. Labs.
Rowe Radio Research
Rubicon Co.
Ruehfel Co.
Specialty Glass Co.
Tagliabue Div.
Taylor & Co., W. A.
Thwing-Albert Inst. Co.

New A-C LOAD VISUALIZER

A COMPACT, PORTABLE SET FOR MEASURING A-C POWER

Here's a new indicating device created by General Electric to meet industry's need for a small, lightweight, low-cost analyzer. Employing an advanced principle of instrument design, it permits all readings to be made on a single scale. Easy to operate and having a wide range of usefulness, this versatile instrument requires only a few simple, convenient connections.

FIVE INSTRUMENTS IN ONE

Besides serving as a standard 0-2.5/5-amp ammeter and a 0-150/300/600-v voltmeter—or with conventional instrument transformers to extend the range—this instrument can be used, with the aid of the calculator provided, to determine quickly and easily watts, vars, and power factor for load surveys, induction motor tests, reactive-power studies, and power-factor improvement programs.

This handy instrument comes complete with an instruction card, calculator, and two 6-foot, flexible voltage leads, all enclosed in a sturdy carrying case. Total weight only five pounds. Write today for Bulletin GEA-4784. *Apparatus Dept., General Electric Co., Schenectady 5, N.Y.*

PRICE $97.50

GENERAL ELECTRIC

SAFEGUARD YOUR TRANSFORMERS WITH A TESCO THERMALARM

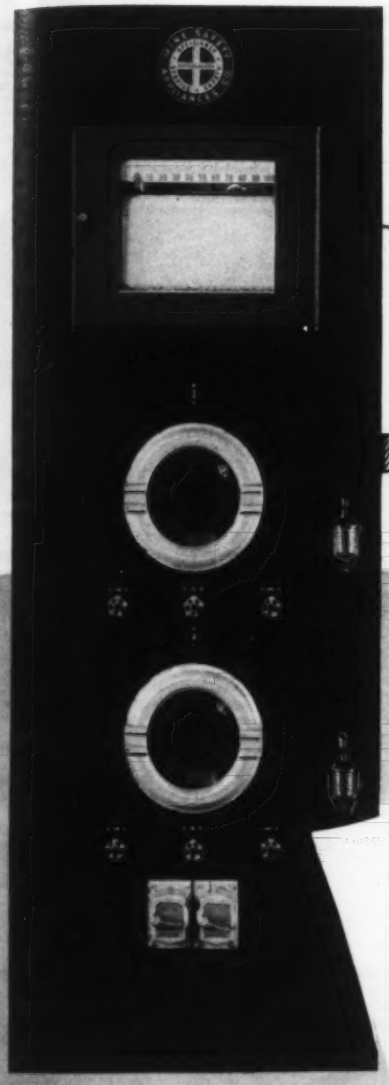
Housed in a Melmac plastic case, 3⅜" long by 1-1/16" wide by 1-1/16" deep, the unit has a die-cast aluminum base, which acts as the heat conductor, projecting from the back. When the safe operating temperature is exceeded, a flag which is spring-actuated and which is normally in a downward position, flies up and presents a brilliant red surface that is large enough to be visible from the ground level.

Write for Bulletin No. 870

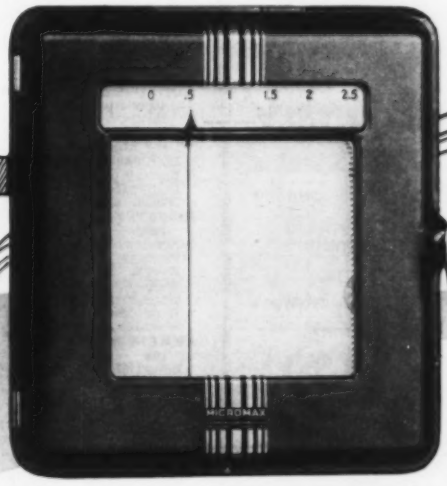
THE EASTERN SPECIALTY CO.

3617 NORTH EIGHTH STREET

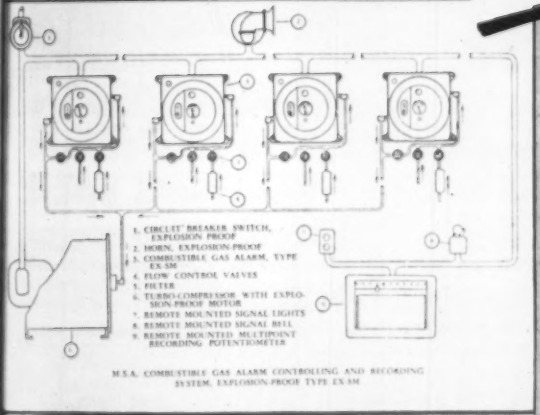
PHILADELPHIA 40, PA.



WHERE MODERN PROCESSING CREATES *MULTIPLE* COMBUSTIBLE GAS HAZARDS...



SPECIFY THE M·S·A *MULTIPLE* COMBUSTIBLE GAS ALARM


1. CIRCUIT BREAKER SWITCH, EXPLOSION PROOF
2. HORN, EXPLOSION-PROOF
3. COMBUSTIBLE GAS ALARM, TYPE EX-5M
4. FLOW CONTROL VALVES
5. FILTER
6. TURBO-COMPRESSOR WITH EXPLOSION-PROOF MOTOR
7. REMOTE MOUNTED SIGNAL LIGHTS
8. REMOTE MOUNTED SIGNAL BELL
9. REMOTE MOUNTED MULTIPOINT RECORDING POTENTIOMETER

M.S.A. COMBUSTIBLE GAS ALARM CONTROLLING AND RECORDING SYSTEM, EXPLOSION-PROOF TYPE EX-5M

All M.S.A. analyzers and accessories with the exception of recording potentiometers are of explosionproof construction, safe for use in Class I Group D locations.

Write for complete information on the type of installation required for your specific application.

For those industrial processes where there are numerous potential combustible gas hazards, M.S.A. multiple analyzer assemblies, either separately or panel mounted, can be provided where continuous testing is required from several locations, and if desired, multi-point recording potentiometers may also be installed. M.S.A. analyzing instruments are available to indicate continuously (normally in percentage of the lower explosive limit) concentrations of combustibles; to operate a signal alarm; to produce a continuous graphic record of concentration or to control circuits when the concentration of flammable atmosphere reaches or exceeds a predetermined setting.

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Autoflight Insts. Div.
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ALTIMETERS, Surveying
American Paulin
Bruning Co.
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ALTITUDE BAROMETERS (See Barometers, Altitude)

AMMETERS, Clamp Type
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Electronic Development
Ferranti Electric
U. S. Gauge
Weston Elec. Inst.

AMMETERS, A-c, Multi-range
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Rawson Elec. Inst.
Roller-Smith Co.
Simpson Electric Co.
Welch Scientific
Westinghouse Elec.

AMMETERS, Contact-making
Edison Electric Controls
Esterline-Angus Co.
General Electric Co.
Hickok Electrical Inst.
Lewis Engineering
Reliance Instrument Co.
Roller-Smith Co.
Taco West Corp
Triplett Elec. Inst.
Weston Electrical Inst.

AMMETERS, Indicating
Assembly Products
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Burlington Inst. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Columbia Elec. Mfg.
Dale Instruments
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Eclipse-Pioneer Div.
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Electro-Mech. Inst.
Electro-Tech Equip.
Electronic Development
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Ferranti Electric, Inc.
General Elec. Co.
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J-B-T Insts.
Lewis Engineering
Lundquist Tool & Mfg.
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MB Instruments
Meters, Inc.
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Norton Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Elec. Inst. Co.
Reliance Instrument Co.
Rochester Mfg. Co.
Roller-Smith Co.
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Simpson Electric Co.
Sticht Co., Herman
Sun Manufacturing
Taco West Corp.
Triplett Electrical Inst.
U. S. Gauge
Welch Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Winslow Co.

AMMETERS, Laboratory Standard
Rawson Elec. Inst.
Roller-Smith Co.
Sensitive Research Inst.
Welch Scientific

AMMETERS, Microammeters
Assembly Products
Ballantine Labs.
Boes Co., W. W.
Burlington Inst. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Clough-Brengle Co.
Dale Instruments
Dayton Acme Co.
De Jur-Amsco Corp.
Electronic Development
Engelhard, Chas.
General Elec. Co.
Hickok Elec. Inst. Co.
Lewis Engineering
Marion Electrical Inst.
MB Instruments
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Norton Electrical Inst.
Pfaltz & Bauer, Inc.
Precision Apparatus Co.
Radio City Products Co.
RCA Div.
Rawson Elec. Inst. Co.
Roller-Smith Co.
Sensitive Research Inst.
Shelby Inst. Co.
Simpson Elec. Co.
Sun Electric Corp.
Taco West Corp.
Tagliabue Div.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Winslow Co.

AMMETERS, Microammeters, A-c Rectifier
Dale Instruments
Electronic Development
Marion Elec. Inst.
MB Instruments, Inc.
Meters, Inc.
Roller-Smith Co.
Simpson Electric Co.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst.

AMMETERS, Milliammeters
Assembly Products
Ballantine Labs.
Boes Co., W. W.
Bristol Co.
Burlington Inst. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Chicago Indust. Inst.
Clough Brengle Co.
Dale Instruments
Dayton Acme Co.
De Jur-Amsco Corp.
Electro-Mech. Inst.
Electronic Development
Engelhard, Chas.
Esterline-Angus Co.
General Elec. Co.
Hickok Elec. Inst. Co.
J-B-T Insts.
Lewis Engineering
Lundquist Tool & Mfg.
Marion Electrical Inst.
MB Instruments
Meters, Inc.
National Tech. Labs.
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AMMETERS, (Cont'd)
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Precision A[illegible]
Radio City [illegible]
Rawson Elec[illegible] Inst. Co.
RCA Manuf[illegible]
Reiner Elect[illegible]
Reliance Ins[illegible]
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Sensitive Re[illegible]
Shelby Instru[illegible]
Simpson Elec[illegible] Co.
Standard Sci[illegible]
Sun Electric [illegible]
Supreme Inst. Corp.
Tagliabue Div.
Thwing-Albert Inst. Co.
Triplett Elect[illegible]al Inst.
Welch Scienti[illegible]
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Winslow Co.

AMMETERS, Recording
Assembly Products
Autocall Co.
Bristol Co.
Cambridge Inst. Co.
Engelhard, Chas.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Massa Labs.
Roller-Smith Co.
Sound Apparatus
Sticht Co.
Tagliabue Div.
Westinghouse Elec.

AMMETERS, Split Core
Assembly Products
Columbia Elec. Mfg.
Dale Instruments
General Elec. Co.
HD Elec. Co.
Norton Electrical Inst.
Roller-Smith Co.
Rubicon Co.
Sticht Co., Herman
Triplett Elec. Inst.
Western Electro Mech.
Weston Elec. Inst. Corp.

AMMETERS, Surge-Crest
Brownell, H. Russell
General Elec. Co.
Sensitive Research Inst.

AMMETERS, Thermionic
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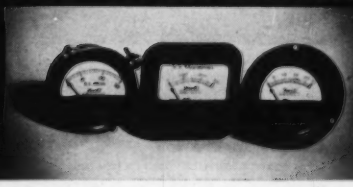
DC

Specifications

TYPES: Ammeters, Milliammeters, Voltmeters, AC and DC; Resistance Meters.

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Sun Manufacturing
Taco West Corp.
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Welch Scientific
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AMMETERS, Thermo-Milliammeters
Dale Instruments
Electronic Development
Lewis Engineering
M B Instruments, Inc.
Meters, Inc.
Rawson Elec. Inst.
Sensitive Research Inst.
Simpson Electric Co.
Welch Scientific
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Rauland Corp.
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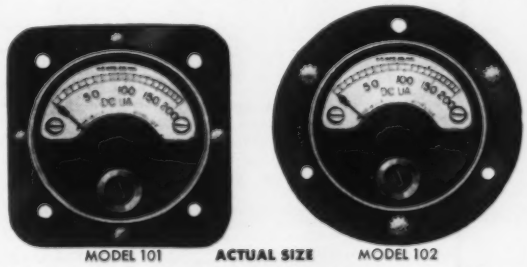

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Reiner Electronics
Rowe Radio Research
Sherron Metallic
Televiso Co.
Thordarson Elec. Mfg.
United Transformer Corp.

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Amplifier Co.
Atomic Instrument
Brownell, H. Russell
Brush Development
Collins Radio Co.
Concord Radio Corp.
Consolidated Engg.
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Electronic Design Corp.
Electronic Lab.
Electronic Prod. Co.
Federal Telegraph Co.
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General Radio Co.
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Islip Radio Mfg.
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McFarlin Co.
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Photovolt Corp.
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Raytheon Mfg. Co.
RCA Div.
Reiner Electronics
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Sherron Metallic
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Ferris Inst. Corp.
General Elec. Co.
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Mine Safety Appliances
National Technical Labs.
Rowe Radio Research
Rubicon Co.
Sargent & Co., E. H.
Scientific Glass App.
Size Control Div.
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ANALYZERS, Electronic Circuit

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Electronic Development
National Tech. Labs.
Precision Apparatus Co.
RCA Div.
Westinghouse Elec.
Weston Elec. Inst.

ANALYZERS, Industrial Circuit Tester

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Electronic Development
Precision Apparatus
Westinghouse Elec.
Weston Elec. Inst.

ANALYZERS, Ignition System

Boes Co., W. W.
Edelmann & Co.
Hickok Electrical Inst.
Lantz-Phelps Corp.
Niehoff & Co., C. E.
Rowe Radio Co.
Sperry Gyroscope Co.
Triplett Elec. Inst.

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Electro-Tech Equip.
Sticht Co., Herman
Triplett Elec. Inst.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

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Amerline
Audio-Tone Oscillator
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Burton Rogers Co.
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Jackson Electrical Inst.
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Triumph Mfg. Co.
Universal Inst. Co.
Waterman Products Co.
Westinghouse Elec.
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Electro Products Lab.
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General Radio Co.
Hewlett-Packard
Hickok Elec. Inst. Co.
RCA Manufacturing Co.
Televiso Co.
Western Electric
Westinghouse Elec.
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Fuess, Inc.
Geophysical Inst. Co.
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Green Henry J.
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Premier Crystal Labs.
Rahm Instruments
Rascher & Betzold
Rawson Elec. Inst. Co.
RCA Manufacturing Co.
Refinery Supply Co.
Rieker Inst. Co.
Robertson & Co.
Rochester Lab. Supply
Roemer Drug Co.
Rowe Radio Research
Ruehfel Co., George
Rupp & Bowman Co.
Sargent & Co.
Schaar & Company
Scientific Glass App.
Scientific Inst. Co.
Scientific Supplies Co.
Seedburo Equip. Co.
Sodemann Heat & Power
Sound Apparatus Co.
Spencer Lens Co.
Standard Glass App.
Standard Science Sup.
Standard Scientific
States Co.
Steele, Erick F.
Stoelting Co., C. H.
Superior Meter Co.
Suter, Alfred
Taber Inst. Corp.
Tagliabue Div.
(Cont'd)

CENCO

FOR THE LATEST AND IMPROVED SCIENTIFIC INSTRUMENTS AND APPARATUS

Write for New Cenco Bulletins:

- **No. 10 High Vacuum Pumps and Equipment**
- **No. 76A Metallurgical Laboratory Apparatus**
- **No. 104A Photoelectric Photometers and Spectrophotometers**

CATALOG R LABORATORY REAGENTS AND CHEMICALS

CENTRAL SCIENTIFIC CO.
Scientific Apparatus
1700 IRVING PARK ROAD, CHICAGO

APPARATUS, Laboratory (Cont'd)

Technical Associates
Technical Products Co.
Thomas Co. Arthur H.
Thordarson Elec. Mfg.
Thwing-Albert Inst. Co.
Ultra-Violet Products
Universal X-Ray Prods.
University Apparatus Co.
Van Dyke Instruments
Walker & Co. Geo. T.
Ward's Natural Science
Waugh Laboratories
Welch Scientific
Western Machinery Co.
Western Scientific Co.
Westinghouse Elec.
Wheaton Co., T. C.
Wilkens-Anderson Co.
Will Corporation
Williams Apparatus Co.
Williams, Brown & Earle
Woods "Lab. Apparatus"
Yonkers Lab. Supply Co.

APPARATUS, Laboratory, Fused Quartz

Crystal Research Labs.
Eastern Industries
Ferguson Co.
Fischer & Porter
Fish-Schurman Corp.
Inst. Development Labs.
Microchemical Service
Stoelting Co., C. H.
Thermal Syndicate, Ltd.
Ultra-Violet Products

APPARATUS, Laboratory, Glass

Ace Glass Inc.
American Inst. Co.
Applied Research
Ballantine Labs.
Boehmke Optical Co.
Boekel & Co.
Burrell Tech Supply
Central Scientific Co.
Chemical Rubber Co.
Chicago Apparatus Co.
Clay-Adams Co.
Corning Glass Works
Distillation Products
Electronic Products
Fassett Co.
Ferguson Co.
Fischer & Porter
Fish-Schuman Co.
Fisher Scientific Co.
Flett Laboratory
Freas Glass Works
General Biological
Goetze Niemer Co.
Griebel Co.
Howe & French, Inc.
(Cont'd)

APPARATUS, Laboratory Glass (Cont'd)

Industrial Timer
Kimble Glass Co.
Laboratory Equip. Co.
Laboratory Materials Co.
Machett & Son
Meyer Scientific Supply
Microchemical Service
Nester Co., Inc.
Palo-Myers, Inc.
Pfaltz & Bauer, Inc.
Philadelphia Therm. Co.
Phoenix Prec. Inst.
Precision Scientific Co.
Precision Thermometer
Rascher & Betzold
Refinery Supply
Rieker Inst. Co.
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Seedburo Equip. Co.
Specialty Glass Co.
Standard Science Sup.
Standard Scientific
Stoelting Co., C. H.
Tagliabue Div.
Technical Products
Tenney Engineering
Thomas Co., Arthur H.
Washington Glass Lab.
Welch Scientific
Wilkens-Anderson Co.
Will Corporation

AREA METERS (See Flow Meters, Area)

ARTIFICIAL HORIZON (See also Aircraft Instruments)

Eastern Science Co.
Eclipse-Pioneer Div.
General Elec. Co.
Sperry Gyroscope Co.

ARTILLERY (See Ordnance)

ASPHALT PENETRATION NEEDLES (See Needles, Asphalt Penetration)

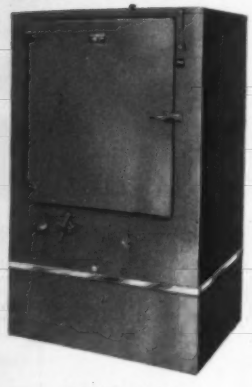
ASPHALT TESTING APPARATUS (See Testers, Asphalt)

ASTRONOMICAL INSTRUMENTS

Berger & Sons
Clark & Sons
Dome Precision
Eastern Science Co.
Eclipse-Pioneer Div.
Fecker, Inc.
Gaertner Scientific Corp.
Henson Co., Fred C.
(Cont'd)

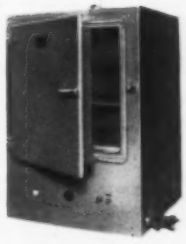
Hotpack

LABORATORY EQUIPMENT

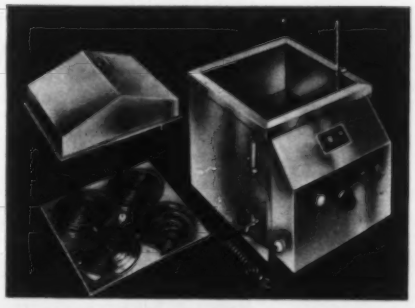


DRYING OVENS
(Mechanically convected)

DRY HEAT BACTERIOLOGICAL INCUBATORS

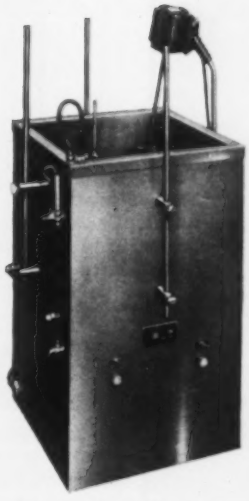


DRY HEAT STERILIZERS



ELECTRIC CONSTANT TEMP. BATHS (table operation) →

WRITE FOR COMPLETE DESCRIPTIVE LITERATURE



ELECTRIC CONSTANT TEMP. BATHS (floor operation)

THE ELECTRIC Hotpack COMPANY, INC.

COTTMAN AVE. AT MELROSE ST. • PHILADELPHIA 35, PENNSYLVANIA

ASTRONOMICAL INSTRUMENTS (Cont'd)

Lenox Inst. Co.
Mico Instrument Co.
Mogey & Sons
Perkin-Elmer Corp.
Palos Optical Co.
Taylor Inst. Cos.
Tinsley Labs.
Unertl Optical Co.
Warren-Knight Co.
White Co.
Carl Zeiss, Inc.

ATTENUATORS

Centralab Div.
Clarke Inst. Co.
Clarostat Mfg. Co.
Daven Co.
Electro Products Lab.
Espey Mfg.
General Radio Co.
Harvey Radio Labs.
Hewlett-Packard Co.
Hickok Electrical Inst.
International Resistance
Leeds & Northrup
Mallory & Co.
Measurements Corp.
Ohmite Mfg. Co.
RCA Div.
Reiner Electronics
Rowe Radio Research
Shallcross Mfg. Co.
Sherron Metallic
Sound Apparatus
Sperry Gyroscope Co.
Trimount Inst. Co.

AUDIO-FREQUENCY EQUIPMENT

Airdesign, Inc.
Allied Radio Corp.
American Communications
Amplifier Co.
Assembly Products
Audio Development Co.
Baird Associates
Ballantine Labs.
Bark's Mfg. Co.
Boonton Radio Corp.
Brownell, H. Russell
Brush Development
Cardwell Mfg. Co.
Century Geophysical
Clark Radio Equip.
Clarke Inst. Corp.
Clough Brengle Co.
Collins Radio Co.
Commercial Research
Concord Radio Corp.
Daven Co.
Eclipse-Pioneer Div.
Electro-Medical Lab.
Electro Products Lab.
Electronic Design Corp.
(Cont'd)

AUDIO-FREQUENCY EQUIPMENT (Cont'd)

Electronic Dev. Lab.
Electronic Prod. Co.
Fairchild Camera
Federal Telegraph Co.
Freed Transformer
General Elec. Co.
General Radio Co.
Geophysical Inst. Co.
Globe Phone Mfg. Co.
Hathaway Inst. Co.
Harvey Radio Labs.
Heiland Research
Hewlett Packard Co.
Hickok Elec. Inst. Co.
Kalbfell Labs., Inc.
Lear, Inc.
Lewyt Metal Prod.
MacLeod & Hanopol
Martin-Hubbard Corp.
McFarlin Co.
Meliaphone Corp.
Metron Instrument
Millen Mfg. Co.
National Co.
Polarad Electronics
Premier Crystal Labs.
Radio Receptor Co.
Rauland Corp.
Raythen Mfg. Co.
RCA Div.
Reiner Electronics
Rowe Radio Research
Shallcross Mfg. Co.
Sherron Metallic
Sound Apparatus
Standard Transformer
Sylvania Elec. Prod.
Technology Instrument
Televiso Co.
Thordarson Elec. Co.
Transmitter Equipment
Triumph Mfg. Co.
United Sound Eng. Co.
United Transformer Corp.
Western Electric
Westinghouse Elec.

AUDIO-FREQUENCY OSCILLATORS (See Oscillators, Audio-Frequency)

AUTOCLAVES, High Pressure to 15,000 lbs./in.2

Parr Instrument

AUTO-COLLIMATORS

Acme Industrial
American Inst. Co.
Clark & Sons
Dome Precision
Dusenberg Co.
Fecker, J. W.
Gaertner Scientific
(Cont'd)

AUTO-COLLIMATORS (Cont'd)

Geophysical Inst. Co.
Kollmorgen Optical Co.
Perkin-Elmer Corp.
Palos Optical Co.
Unertl Optical Co.

AUTOMATIC (See Controllers or Regulators)

AUTOMOTIVE SERVICE INSTRUMENTS

Airdraulics Engineering
Bacharach Indus. Inst.
Bear Mfg. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Clough-Brengle Co.
Engelhard, Chas.
Hays Corp.
Hickok Elec. Inst. Co.
Instrument Specialties Co.
Kimble Glass
Niehoff & Co.
Potter Co.
Rieker Inst. Co.
Rowe Radio Res.
Triplett Elec. Inst.
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

AVIATION INSTRUMENTS, see also Aircraft; Inclinometers, Lateral; Indicators, Pitch & Bank; Chambers, Test & Calibration, etc.

Aircraft Indicators Co.
Airdaulics Engineering
American Meas. Inst.
American Paulin System
Autoflight Insts. Div.
Bailey Meter Co.
Boes Co., W. W.
Boston Auto Gage
Cook Electric
De Jur-Amsco Corp.
Eclipse-Pioneer Div.
Edison Electric Controls
Federal Telegraph Co.
Fischer & Porter
Fulton Sylphon Co.
General Elec. Co.
Guardian Elec. Mfg.
Kollsman Inst. Div.
Lackner Co.
Lewis Engineering
Machlett & Son
M B Instruments
Modern Product Div.
North Amer. Inst. Co.
Revere Corp.
Sperry Gyroscope Co.
Televiso Co.
(Cont'd)

AVIATION INSTRUMENTS (Cont'd)

Trimount Inst. Co.
Triplett Elec. Inst.
U. S. Taximeter
Wallace & Tiernan
Westinghouse Elec.
Weston Elec. Inst.
Wheelco Instruments
White & Co., David

AZIMUTH INSTRUMENTS

Avion Instrument
Bliss & Co.
Dusenberg Co.
Eastern Science Co.
Eastern Specialty Co.
Fecker, J. W.
Gaertner Scientific Corp.
Hand & Sons
Keuffel & Esser Co.
Kollmorgen Optical Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.
Stafford Co.
Warren-Knight Co.
White Co.

BALANCES (See also object of measurement and control)

BALANCES, Analytical

Ainsworth & Sons
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Dietert Co.
Exact Weight Scale Co.
Fisher Scientific Co.
Goetze Niemer Co.
Heusser Instrument
Microchemical Service
Pfaltz & Bauer, Inc.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Suter, Alfred
Thomas Co., Arthur H.
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Voland & Sons
Welch Scientific

BALANCES, Assay

Ainsworth & Sons
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Exact Weight Scale
Heusser Instrument
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Automatic Recording

Becker, Inc., Christian
Roller-Smith Co.

BALANCES, Bullion

Becker Inc., Christian
Exact Weight Scale
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Gas Density

Central Scientific Co.
Exact Weight Scale Co.
Hagan Corp.
Refinery Supply Co.
Thomas Co., Arthur H.

BALANCES, Hydrostatic

Central Scientific Co.
Chicago Apparatus Co.
Seederer-Kohlbusch, Inc.

BALANCES, Jewelers

Becker Inc., Christian
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Joly's

Central Scientific Co.
Welch Scientific

BALANCES, Magnetic

Becker Inc., Christian
Exact Weight Scale
Geophysical Inst. Co.
Instrument Lab., Inc.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Voland & Sons

BALANCES, Magnetic (Geophysical)

Geophysical Inst. Co.
Ruska Inst. Corp.
Voland & Sons

BALANCES, Micro

Ainsworth & Sons
Becker Inc., Christian
Cady & Co., E. J.
Central Scientific Co.
Heusser Instrument
Microchemical Service
Pfaltz & Bauer, Inc.
Thomas Co., Arthur H.
Torsion Balance Co.
Voland & Sons, Inc.

BALANCES, Precision for Weights & Measures

Ainsworth & Sons
Becker Inc., Christian
Burke & James
Cady & Co., E. J.
Central Scientific Co.
Chatillon & Sons
(Cont'd)

BALANCES, Precision for Weights & Measures (Cont'd)

Exact Weight Scale Co.
Heusser Instrument
W. & L. E. Gurley
Jacobs Bros. Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Scientific Co.

BALANCES, Pulp

Ainsworth & Sons
Becker Inc., Christian
Central Scientific Co.
Exact Weight Scale
Heusser Instrument
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc.
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Thwing-Albert Inst. Co.
Voland & Sons, Inc.
Williams Apparatus Co.

BALANCES, Specific Gravity

Baird Associates
Becker Inc., Christian
Central Scientific
Chicago Apparatus Co.
Eberbach & Son
Exact Weight Scale Co.
Heusser Instrument
Humboldt Mfg. Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Refinery Supply
Ruehfel Co.
Seederer Kohlbusch, Inc.
Thomas Co., Arthur H.
Torsion Balance Co.
Troemner, Henry
Welch Scientific

BALANCES, Surface Tension

Becker Inc., Christian
Central Scientific Co.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Triple Beam

Ainsworth & Sons, Inc.
Central Scientific
Dietert Co., Harry W.
Exact Weight Scale Co.
Fisher Scientific Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Troemner, Henry
Welch Scientific

What's YOUR special battery problem?

Here's a Tough One Burgess Engineers Solved.

THE PROBLEM

To build a battery in excess of 2000 volts within very limited physical specifications . . . to be sealed in a metal container . . . to have long shelf life . . . and to be equipped with 17 voltage taps.

THE SOLUTION

A ruggedly constructed battery fully insulated, delivering *2025 volts*, and equipped with two plug-in and one wire lead terminal. Compact in size . . . built within a tight metal container.

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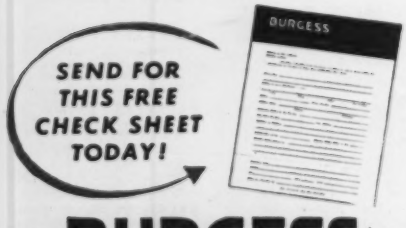
Design . . . Engineering . . . Production

. . . is at your disposal to provide the battery you need in the quantity you need . . . large or small.

Send for this free check-sheet . . . it enables you to easily and quickly provide Burgess engineers with all the information important to the design of a battery for your special requirements.



BURGESS BATTERY COMPANY
FREEPORT, ILLINOIS

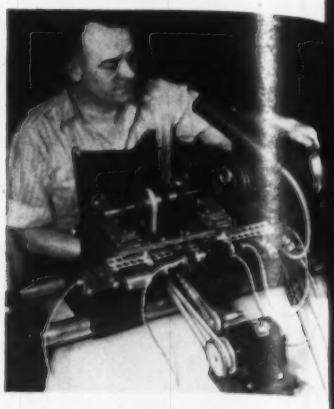
The DYNOGRAPH BALANCER

•

A Precision, Electronic type Dynamic Balancing Machine for small, high speed rotors.

•

R. B. ANNIS COMPANY
1103 N. Delaware, Indianapolis 2, Ind.



BALANCES, Volumetric Flask
Becker Inc., Christian
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Westphal
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Fisher Scientific
Pfaltz & Bauer, Inc.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Torsion-Balance Co.
Troemner, Henry

BALANCING MACHINES, Dynamic
Annis Co.
Bear Mfg. Co.
Electronic Corp.
Exact Weight Scale
Ferner Co.
General Elec. Co.
Gisholt Machine Co.
Globe Tool & Engg.
Olsen Testing Machine
Sperry Gyroscope Co.
Suter, Alfred
Waugh Labs. (portable)
Westinghouse Elec.

BALANCING MACHINES, Static
Anderson Bros. Mfg. Co.
Annis Co.
Best Mfg. Co.
Commerce Pattern Fdry.
Exact Weight Scale
Ferner Co.
Gisholt Machine Co.
Gelber, Saml. S.
Globe Tool & Engg.
Ideal Industries, Inc.
Olsen Testing Machine
Sunstrand Machine Tool
Suter, Alfred
Taylor Mfg. Corp.
Toledo Scale Co.

BALLISTIC INSTRUMENTS, Crime Detection (See Microscopes, Ballistic Comparison)

BALLISTIC INSTRUMENTS, Electrical
Berkeley Scientific
Brownell, H. Russell
Cambridge Inst. Co.
General Elec. Co.
Leeds & Northrup Co.
Potter Instrument
Precision Ther. & Inst.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Triplett Elec. Inst.
Westinghouse Elec. & Mfg.

BALLISTIC INSTRUMENTS, Ordnance
Bausch & Lomb Opt.
Berkeley Scientific
Cambridge Inst. Co.
Precision Therm. & Inst.
Rawson Elec. Inst. Co.

BANK & TURN INDICATORS
Burton Mfg. Co.
Eclipse-Pioneer Div.
Ideal Lab. Tool
Schwien Engineering

BARKOMETERS
Central Scientific Co.
Freas Glass Works
Fleischhauer & Son
G. M. Mfg. Co., Inc.
Griebel Co.
H-B Inst. Co., Inc.
Moeller Instrument Co.
Precision Therm. & Inst.
Ruehfel Co.
Tagliabue Div.
Taylor Inst. Cos.
Weksler Thermometer

BAROGRAPHS (See Barometers, Recording)

BAROMETERS, Altitude
American Askania Corp.
Am. Paulin System
Avion Instrument
Bruning Co.
Chelsea Clock Co.
Eclipse-Pioneer Div.
Friez Instrument
Fuess, Inc.
Green, Henry J.
H & H Thermostats
Ideal Lab. Tool
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Div.
Mine Safety App. Co.
Panoramic Radio Co.
Post Co.
Precision Thermometer
Taylor Inst. Cos.
Technicraft Engg.
Thwing-Albert Inst. Co.
Wallace & Tiernan
Warren Knight Co.
Welch Scientific
Westinghouse Elec.
White Co.

BAROMETERS, Aneroid
Am. Paulin System
Avion Instrument
Central Scientific Co.
Chelsea Clock Co.
Eclipse-Pioneer Div.
Fisher Scientific
Friez Instrument
Fuess, Inc.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Co.
Mine Safety App. Co.
Post Co.
Precision Instrument
Roth Bros. Chronometer
Scientific Inst. Co.
Stewart, M. C.
Taylor Inst. Co.
Testrite Instrument Co.
Wallace & Tiernan
Warren Knight Co.
White Co.

BAROMETERS, Mercurial
Alpha Instrument Co.
Builders-Providence
Central Scientific Co.
Chicago Apparatus Co.
Defender Automatic Reg.
Dietert Co.
Eberbach & Son
Eclipse-Pioneer Div.
Electronic Products Co.
Fisher Scientific Co.
Friez Instruments
Fuess, Inc.
Gaertner Scientific
Green, Henry J.
Ideal Lab. Tool
Kessler Co.
Manning, Maxwell & Moore
Moeller Instrument Co.
Pioneer Instrument Co.
Precision Thermometer
Sargent & Co.
Scientific Inst. Co.
Specialty Glass Co.
Standard Science Sup.
Stoelting Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Instrument Co.
Universal X-Ray Prods.
Wallace & Tiernan
Weksler Thermometer
Welch Scientific

BAROMETERS, Recording
Aerological Developments
Am. Paulin System
Avion Instrument
Bristol Co.
Brown Inst. Co.
Foxboro Co.
Friez Instrument
Fuess, Inc.
Green, Henry J.
Hathaway Instrument
H & H Thermostats
Impact Register
Kenyon Instrument Co.
Keuffel & Esser Co.
Taylor Inst. Cos.
Uehling Instrument Co.

BAROMETERS, Station
American Paulin
Friez Instrument
Ideal Lab. Tool
Manning, Maxwell, Moore
Universal X-Ray Prods.
Wallace & Tiernan

BAROMETRIC PRESSURE INDICATORS
Am. Paulin System
Bristol Co.
Electronic Products
Foxboro Co.
Friez Instrument
Fuess, Inc.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Div.
Manning, Maxwell & Moore
Meriam Inst. Co.
Pioneer Inst. Co.
Precision Therm.
Statham Labs.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.
Wallace & Tiernan
Warren Knight Co.

BAROMETRIC PRESSURE RECORDERS (See Barometers, Recording)

BATTERIES, Dry
Burgess Battery Co.
Kellogg Switchboard
Magnavox Co.
Mallory and Co.
Ray-O-Vac Co.
RCA Div.
Walker-Jimieson, Inc.

BATTERY CHARGERS
American Communications
Automatic Electric Sales
Benwood Linze
Control Corp.
Cutler-Hammer, Inc.
Eclipse-Pioneer Div.
Electrical Facilities, Inc.
Federal Telegraph Co.
Ferranti Electric, Inc.
General Electric Co.
Kellogg Switchboard
Mallory & Co.
Mellaphone Corp.
Modern Controls
Radio Receptor Co.
Schauer Mach. Co.
Sorenson & Co.
Standard Transformer
Ward Leonard Electric Co.
Westinghouse Elec.

BATTERY ELIMINATORS
American Communications
Assembly Products
Automatic Electric Sales
Benwood Line
Consolidated Engg.
Electro Products Labs.
Electronic Prod. Co.
General Electric Co.
General Radio Co.
Hagan Corp.
Kellogg Switchboard
Mallory & Co.
Mellaphone Corp.
National Time & Signal
RCA Div.
Schauer Mach. Co.
Standard Electric Time Co.
Standard Transformer

BATTERY TESTERS (See Testers & Testing Machines, Battery)

BEAM COMPASSES (See Drawing Instruments)

BEARING CIRCLES
Alpha Instrument Co.
Dusenbery Co.
Eastern Specialty Co.
Geophysical Inst. Co.
Kollmorgen Optical Co.
Negus, T. S. & J. D.

BEARING TESTERS (See Testers Bearing)

BEATING TESTERS (See Testers, Beating)

BELLOWS, METALLIC
Askania Regulator Co.
Bridgeport Thermostat Co.
Chicago Metal Hose
Clifford Mfg. Co.
Cook Electric Co.
Fulton Syphon Co.
Ranco, Inc.

BENCHES, Optical
Baird Associates
Bausch & Lomb
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Fuess, Inc.
Gaertner Scientific Corp.
Geophysical Inst. Co.
Jarrell-Ash Co.
Mico Instrument Co.
Carl Zeiss, Inc.

BEVEL PROTRACTORS (See Drawing Instruments)

BIN LEVEL INDICATORS (See Controllers, Automatic, Granular Material Level)

BINNACLES (See Nautical Instruments)

BINOCULARS
Alpha Instrument Co.
Am. Telescope Labs.
Bausch & Lomb Optical
Clark & Sons
Dome Precision
Eclipse-Pioneer Div.
Fecker, Inc.
Kollsman Inst. Div.
Mogey & Sons
Palos Optical Co.
Testrite Instrument Co.
Unertl Optical Co.
Warren Knight Co.
White Co.
Wollensak Optical Co.

BINOCULARS, Polarizing Variable Density, etc
Amer. Telescope Labs.
Polarizing Inst. Co.

BLAST METER (See Flow Meters, Blast)

BOILER METERS
American Meter Co.
Bailey Meter Co.
Brooke Engineering
Brown Inst. Co.
Ess Inst. Co.
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
Henszey Co.
Leeds & Northrup
Penn Ind. Inst. Corp.
Republic Flow Meters
Simplex Valve & Meter
Tagliabue Div.

BOLOMETERS
Baird Associates
Ballantine Labs.
Cambridge Inst. Co.
Eppley Laboratory
Sperry Gyroscope Co.

BOMBS, High pressure for testing bottom hole samples, Oil & Gas
American Inst. Co.
Precision Scientific
Refinery Supply Co.
Ruska Inst. Co.

BOMBS, Hydrogenation
American Inst. Co.
Parr Instrument Co.
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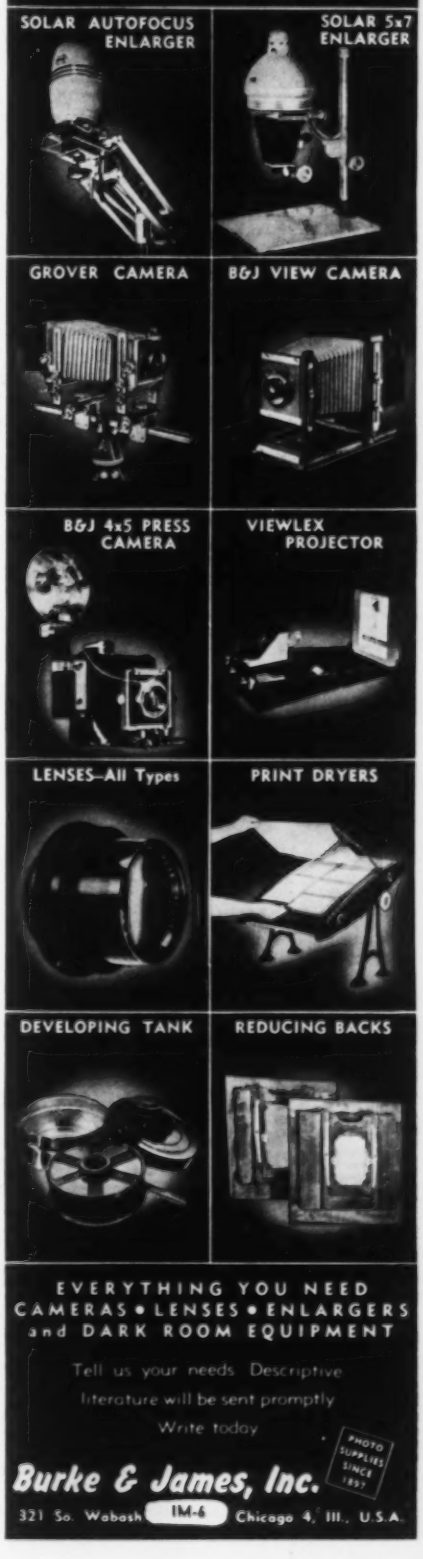

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Pierce Watch Co.
Potter Instrument
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Roth Bros. Chronometer
Sticht Co.
Waugh Laboratories

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Ducommun Co.
Gaertner Scientific
Hamilton Watch
Jardur Import Co.
Meridian Instrument
Negus, T. S. & J. D.
Roth Bros. Chronometer
Standard Electric Time
Waltham Watch Co.

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Rawson Elec. Inst.
Stoelting Co., C. H.

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Cincinnati Clock

CLASSIFIERS, Particle Size, Air
Federal Pneumatic Sys.
Sturtevant Mill

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Kuner Co., Max
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Moeller Inst. Co.
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Precision Thermometer

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General Elec. Co.
Howard Clock Products
(Cont'd)

CLOCKS, Master (Cont'd)
International Bus. Mach.
Kurman Electronics
Landis & Gyr, Inc.
National Time & Signal
Paragon Electric Co.
Standard Elec. Time
Stromberg Time Corp.
Telechron, Inc.
Thomas Clock Co.
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Betts & Betts
Chelsea Clock Co.
Cincinnati Time Rec. Co.
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General Elec. Co.
Hansen Co.
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Howard Clock Products
International Bus. Mach.
Kurman Electronics
Landis & Gyr
Leich Electric Co.
National Time & Signal
Paragon Electric Co.
Standard Elec. Time Co.
Stoelting Co.
Stromberg Time Corp.
Telechron, Inc.
Thomas Clock Co.
Tork Clock
Westinghouse Elec.
Zenith Electric Co.

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General Radio Co.
Howard Clock Products
International Bus. Mach.
Kurman Electronics
Landis & Gyr
National Time & Signal
Roth Bros. Chronometer
Standard Elec. Time
Stromberg Time Corp.
Telechron, Inc.
Thomas Clock Co.
Walter & Tiernan

CLOCKS, Secondary
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Cincinnati Time Rec. Co.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Kurman Electronics
Landis & Gyr
(Cont'd)

CLOCKS, Secondary (Cont'd)
National Time & Signal
Standard Elec. Time
Stromberg Time Corp.
Telechron, Inc.
Thomas Clock Co.

CLOCKS, Standard
Ansonia Clock Co.
Aristo Import Co.
Chelsea Clock Co.
Cincinnati Time Rec.
Foxboro Co.
Gaertner Scientific Corp.
Hansen Co.
Jaeger Watch Co.
Kollsman Inst. Co.
Kurman Electronics
Lux Clock Mfg. Co.
Roth Bros. Chronometer
Seth Thomas Clock
Standard Elec. Time
Stromberg Time Corp.
Telechron, Inc.
Waltham Watch

CLOCKS, Stop
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Elgin Nat. Watch
Fish-Schurman Co.
Glogau & Co.
Jaeger Watch Co.
Jardur Imoprt Co.
Paragon Electric Co.
Precision Scientific Co.
Roth Bros. Chronometer
Standard Elec. Time
Sticht Co.
Stoelting Co., C. H.
Tagliabue Div.
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Central Scientific Co.
Corning Glass Works
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Bausch & Lomb Optical
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Electronic Research Labs.
Fisher Scientific Co.
Gaertner Scientific Corp.
Hellige, Inc.
Jarrell-Ash Co.
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Macbeth Corp.
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COLOR GRADERS (See Color Analyzers, Photoelectric)

COLOR MATCHING OUTFITS (See Color Comparators, Visual)

COLORIMETER TUBES (See Colorimeters, Visual)

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National Tech. Labs.
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Photovolt Corp.
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Coleman Electric Co.
Electronic Research Labs.
Fischer & Porter
Fish-Schurman Corp.
Fisher Scientific Co.
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COMBUSTION, Indicators and Recorders (See Gas Analyzers, Boiler Meters, etc.)

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und Apparatus
afford Co.
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ordarson Elec. Mfg.
rmount Inst. Co.
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Size Control Div.
Standard Gage
(Cont'd)

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American Meas. Inst.
Bausch & Lomb Optical
Cambridge Inst. Co.
DoAll Co.
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Ferner Co.
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Gaertner Scientific
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Leitz Inc.
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Scherr Co. Inc.
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Surface Checking Gage

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Star Compass Co.

COMPASSES, Automobile
Autoflight Insts. Div.
Hull Mfg. Co.
Star Compass Co.
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Abrams Instrument
Ainsworth & Sons
Autoflight Insts. Div.
Avion Instrument
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Dusenbery Co.
Keuffel & Esser Co.
Leopold & Stevens
Negus, T. S. & J. D.
Pioneer Instrument
Suverkrop Instruments
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CONDENSER, Electric (See Capacitors)

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Electronic Dev. Lab.
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Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Jackson Electrical Inst.
Leeds & Northrup Co.
Potter Co.
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Tobe Deutschmann Corp.
Triplett Elec. Inst.
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Accurate Pyrometric Cone
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Wheelco Insts. Co.

CONES, Slump
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Clare & Co.
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Federal Telegraph Co.
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Johnson Co., E. F.
Jones, Howard B., Div.
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Meter Devices Co.
Millen Mfg. Co.
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Kollman Instrument
Taylor Inst. Co.
White Co., Inc., David

COMPASSES, Magnetic
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Baker Compass-Co.
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Taylor Inst. Cos.
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Bendix Marine Products
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Dusenbery Co.
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Kuner Co., Max
Marine-Compass Co.
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Northwest Instrument
Sperry Gyroscope Co.
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Eclipse-Pioneer Div.
Fisher Research Lab.
Hickok Elec. Inst. Co.
Northwest Instrument
RCA Div.
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COMPASSES, Ship (See Compasses, Marine)

COMPASSES, Telltale (See Compasses, Marine)

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CONTROL DRIVES (See Servo-Motors)

CONTROLS, AUTOMATIC (See Controllers, Automatic)

CONTROLLERS, AUTOMATIC (See object of Measurement and Control)

"CONTROL" — NOTE —

The following pages deserve close study. Note for example that after numerous "Controllers, Automatic" there are three classes of "Controllers, Manual." Look up also under "Regulators" for many types thus termed by usage. Also "Thermostats" and other commonly-used names of specific-purpose automatic controllers.

As a rule, Automatic Controllers are "Instrument like" while devices known as Controls (preceded by name of application) are simple, single-purpose devices.

CONTROLLERS, AUTOMATIC, Ammonia (See Ammonia Control Equipment)

CONTROLLERS, AUTOMATIC, Beater (See Controllers, Automatic, Consistency)

CONTROLLERS, AUTOMATIC, Bin (See Controllers, Automatic, Granular Material, Level)

CONTROLLERS, AUTOMATIC, Boiler Feed
A-Jacks Automatic
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Campbell Co., J. A.
Combustion Control Corp.
Fisher & Porter
Fisher Governor
Foster Engg. Co.
Foxboro Co.
General Controls
Hammel-Dahl Co.
(Cont'd)

CONTROLLERS, Automatic, Boiler Feed (Cont'd)
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Kiely & Mueller
Leeds & Northrup
Lumenite Co.
Magnetrol, Inc.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Mercoid Corp.
Mercon Regulator Co.
Natural Gas Equipment
Northern Equip. Co.
Photoswitch, Inc
Republic Flow Meters Co.
Robertshaw Thermostat
Ruggles Klingemann
Taylor Inst. Co.
Trimount Inst. Co.
Warrick Co.
Watts Regulator Co.
Wheelco Instruments
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Boiler Water Concentration
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Fischer & Porter
Foxboro Co.
General Controls
Henszey Co.
Leeds & Northrup Co.
Lumenite Co.
Manning, Maxwell & Moore
Powers Regulator
Republic Flow Meters

CONTROLLERS, AUTOMATIC, Bulk Material Level (See Controllers, Automatic, Granular Material Level)

CONTROLLERS, AUTOMATIC, Chlorine
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Askania Regulator Co.
Builders-Providence
Cash Co.
Everson Mfg. Co.
Fischer & Porter
Foxboro Co.
General Controls
Hammel-Dahl Co.
LaMotte Chemical Prod.
Manning, Maxwell & Moore
National Meter Co.
Photoswitch, Inc.
Proportioneers, Inc.
Rasher & Betzold
Republic Flow Meters
Shallcross Controls
Taylor Inst. Co.
Wallace & Tiernan

CONTROLLERS, AUTOMATIC, Combustion
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Anderson Co.
Arca Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Brooke Eng. Co.
Cambridge Inst. Co.
Cash Co.
Combustion Control Corp.
Denver Fire Clay Co.
Electronic Prod. Co.
Fischer & Porter
Fisher Governor
Foxboro Co.
Furst Electronics
General Combustion Corp.
General Controls
General Regulator Corp.
Hagan Corp.
(Cont'd)

CONTROLLERS, Automatic, Combustion (Cont'd)
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Hays Corp.
Lantz-Phelps Corp.
Leeds & Northrup Co.
Mason-Neilan Reg. Co.
Mercoid Corp.
Minneapolis-Honeywell
National Airoil Burner
National Brass Co.
Natural Gas Equipment
Partlow Corp.
Perfex Corp.
Republic Flow Meters
Sampsel Time Control
Selas Company
Shallcross Controls
Taylor Inst. Co.
Worner Electronics

CONTROLLERS, AUTOMATIC, Condensation
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Boylston Co.
Cash Co.
Fisher Governor Co.
General Controls
General Regulator Corp.
Hammel-Dahl Co.
Manning, Maxwell & Moore
Photoswitch, Inc.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Tagliabue Div.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Condenser Leakage
Foxboro Co.
Kellogg Switchboard
Leeds & Northrup Co.
Manning, Maxwell & Moore
Warrick Co.

CONTROLLERS, AUTOMATIC, Consistency
Askania Regulator Co.
Brabender Corp.
Bristol Co.
Electric Eye Equipment
Foxboro Co.
General Controls
Hammel-Dahl Co.
Mason-Neilan Regulator
McAlear Mfg.
Merritt Engr. & Sales
Northern Equip. Co.
Shallcross Controls
Taylor Inst. Co.

CONTROLLERS, AUTOMATIC, Counting
Abrams Instrument
Adde & Co.
Automatic Elec. Sales
Automatic Temp. Contr.
Bristol Co.
Eagle Signal Corp.
Electronic Controls
Lansing Engineering
Lumenite Electric Co.
Manning, Maxwell & Moore
Martin-Hubbard Corp.
National Time & Signal
Paragon Electric Co.
Photoswitch, Inc.
Potter Instrument
RCA Manufacturing Co.
Standard Electric Time

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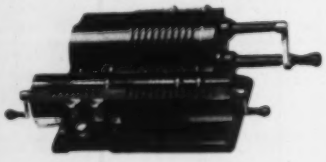

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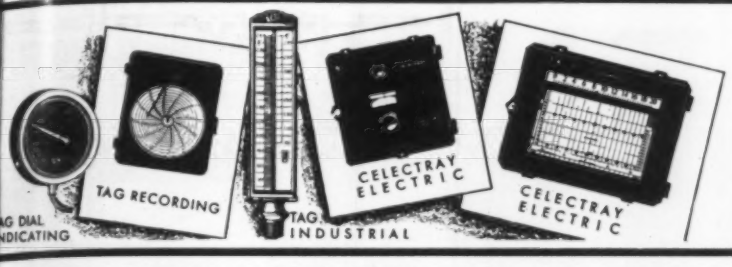

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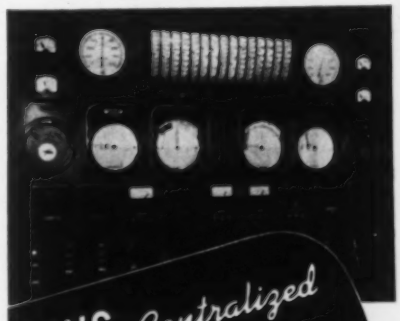

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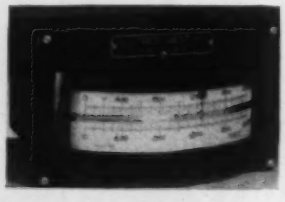

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Sampsel Time Control
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Cook Electric Co.
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Bailey Meter Co.
General Controls
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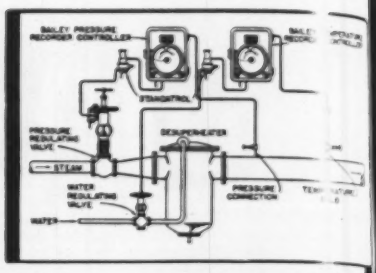

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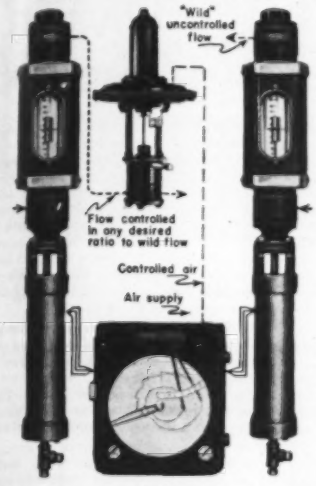

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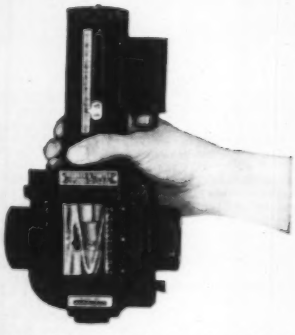

The Ratosight-Alarm provides continual visual indication of flow rate and responds instantaneously to flow rate changes only. A magnetic extension on the "metering-float" trips external switches to operate the alarm circuit. The alarm flow point is adjustable over the entire flow range and operates accurately at the set position. Built in sizes up to 1½" and stocked in cast iron and brass.

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General Controls
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Leeds & Northrup Co.
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Automatic Elec. Mfg.
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Cutler-Hammer, Inc.
Electronic Controls
Fisher-Pierce Co.
General Controls
General Elec. Co.
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Available for gasoline, oil, ammonia or other low specific gravity liquids. Also for liquids at high pressures.

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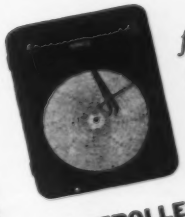
All Mercoid Controls are equipped exclusively with mercury switches—assuring better control performance and longer control life.

COMPLETE INSTRUMENTATION



for **INDUSTRIAL PROCESSES**

CONTROLLERS for temperature, pressure, absolute pressure, rate of flow and liquid level. Air-operated potentiometer controllers. Exclusive features resulting in unexcelled performance.

RECORDERS of temperature, pressure, flow level, motion, absolute pressure.

INDICATORS of temperature, pressure, flow and level.

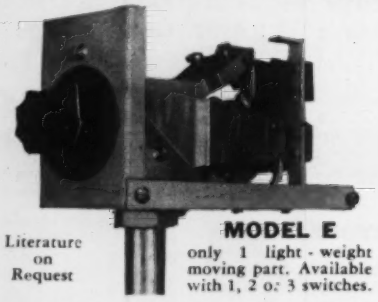
TRANSMISSION SYSTEMS, pneumatic type with exceptionally fast response. Electric signalling systems.

MASONEILAN

MASON-NEILAN REGULATOR CO.
1185 ADAMS ST., BOSTON, MASS., U. S. A.

BURLING
TEMPERATURE LIMIT SWITCHES

USE NO LIQUIDS . . . NO GASES



Literature on Request

MODEL E

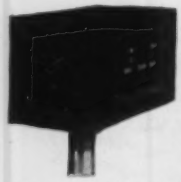
only 1 light-weight moving part. Available with 1, 2 or 3 switches.

As a 3 switch model, Burling Model E is recommended for use (a) where load is divided into 3 parts, (b) where 1 switch is used for controlling, one as a high limit, one as a low limit, (c) to give definite stops or position to a 3 or 4 position diaphragm motor, (d) to give 3 speed control of variable speed motor.

- Accurate, Rugged, Dependable
- Corrosion and heat resisting tube
- Dial Pointer for easy setting
- Locking screw locks temperature setting
- Terminal plate has large screw terminals
- Snap-action Micro-Switch eliminates contact troubles
- Increased Adjustable range to 700-1000°
- Dimensions—7¼" x 2¾" x 3½"

MODEL V-1

For lower temperature range from 0-300°F. Available for minimum of —100° to maximum of 600°F. Usual adjustable range 50-150°, operating differential may be as small as ± ¼ or as large as ± 5°. Adjustable by screw and dial inside case. (Sizes 2¾" diameter × 4¼" high).



MODEL D

Adjustable range 200-500°F. Temperature range 0-1400°F. For use where temperature must be changed to suit operating conditions. Turn outside knob to change temperature setting. (Sizes 5½ x 2¾ x 2¾").

Instruments also Built to Specifications

Making Precision Controls for Over 11 Years

BURLING INSTRUMENT CO.
251C Springfield Ave.
Newark, N. J.

CONTROLLERS, AUTOMATIC, Liquid Level
Allen-Bradley Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bastian-Blessing Co.
Belfield Co.
Bin-Dicator Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Builders Providence
B. W. Controller
Cash Co.
Conoflow Corp.
Control Corp.
Cook Electric
Cutler-Hammer, Inc.
Davis Reg. Co.
DefenderAutomatic Reg.
D'Este Division
Elec. Indicator Co.
Electronic Prod. Co.
Fischer & Porter
Fisher Governor Co.
Fisher-Pierce Co.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Fuller Co.
General Controls Co.
General Electric Co.
General Regulator Corp.
Grove Regulator
Guardian Elec. Mfg. Co.
Hagan Corp.
Hammell-Dahl Co.
Hays Corp.
Henszey Co.
Inferno Co.
Inflico, Inc.
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leeds & Northrup Co.
Leupold & Stevens
Lumenite Co.
Magnetrol, Inc.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honewell
Moore Products Co.
Morey & Jones, Ltd.
Natural Gas Equipment
Northern Equip. Co.
Paragon Electric Co.
Penn Electric Switch
Penn Ind. Inst. Corp.
Petrometer Corp.
Photoswitch, Inc.
Positel Mfg. Co.
Powers Regulators Co.
Precision Therm.
Reliance Gauge Column
Republic Flow Meters
Rowan Controller Co.
Ruggles Klingemann
Sarco Co., Inc.
Schade Valve Mfg. Co.
Shallcross Controls
Simplex Valve & Meter
Sparling, R. W.
Spence EngineeringCo.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Instrument Co.
United Electric Controls
Warrick Co.
Water Level Controls Co.
Watts Regulator Co.
Wheelco Inst. Co.
Wilgus Mfg. Co.
Wood, Harry W.

CONTROLLERS, AUTOMATIC, Load (See Regulators)

CONTROLLERS, AUTOMATIC, Moisture (See Controllers, Automatic, Humidity)

CONTROLLERS, AUTOMATIC, pH
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Foxboro Co.
General Controls
Leeds & Northrup
Macbeth Corp.
Milton Roy Pumps
National Tech. Labs.
Thwing-Albert Inst. Co.

CONTROLLERS, AUTOMATIC, Phase (See Regulators)

CONTROLLERS, AUTOMATIC, Power Factor (See Regulators)

CONTROLLERS, AUTOMATIC, Pressure & Vacuum
Ace Instrument Co.
Acme Regulator Co.
Allen-Bradley Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Avion Instrument
(Cont'd)

CONTROLLERS, Automatic, Pressure & Vacuum (Cont'd)
Bailey Meter Co.
Barber-Colman
Bastian-Blessing Co.
Beck Co.
Belfield Co.
Black Mfg. Co.
Bockel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Builders-Providence
Cas Co.
Conoflow Corp.
Cook Electric
Cutler-Hammer, Inc.
Davis Reg. Co.
D'Este Co.
Dickson Co.
Distillation Products
Douglass Automatic
Eclipse Fuel Engg.
Electronic Engineers
Electronic Prod. Co.
Emerson Apparatus Co.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
Fredericks, George
Fulton Sylphon Co.
Furnas Electric Co.
Gas Appl. Specialties
General Controls Co.
General Electric Co.
General Regulator Corp.
Gen. Sales & Prod.
Gotham Inst. Co.
Grove Regulator
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
H & H Thermostats
Hoke, Inc.
Hydraulic Controls, Inc.
Hydraulic Press Co.
Illinois Engg. Co.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
Leeds & Northrup Co.
Leslie Co.
Lyman Electronic
Manning, Maxwell, Moore
Marsh Corp.
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Meletron Corp.
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products
Mu-Switch Corp.
Nason Co.
National Time & Signal
Natural Gas Equip. Inc.
Northern Equip. Co.
Norwalk Valve Co.
Penn Electric Switch
Penn Ind. Inst. Corp.
Perfex Corp.
Powers Regulator Co.
Precision Therm.
Ranco, Inc.
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Robinette Co., W. C.
Ruggles Klingemann
Sampsel Time Control
Schade Valve Mfg. Co.
Schwien Eng. Co.
Scientific Inst. Co.
Seely Instrument Co.
Selas Co.
Shallcross Controls
Skaneateles Mfg.
Spence Engineering Co.
Squires Co.
Sterling Eng. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Tenney Engineering
Trerice Co., H. O.
Trimount Inst. Co.
United Elec. Controls
Uehling Instrument Co.
Vapor Recovery Systems
Vaughn-G. E. Witt Co.
Wallace & Tiernan
Ward Leonard Elec. Co.
Water Level Controls Co.
Watts Regulator Co.
Waugh Laboratories
Wheelco Inst. Co.
White-Rodgers Electric
Wilgus Mfg. Co.
Wood, Harry W.

CONTROLLERS, AUTOMATIC, Pyrometric
Am. Gas Furnace Co.
Ashcroft Auto. Cont.
Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Dickson Co.
Electronic Lab.
Electronic Prod. Co.
Engelhard, Chas.
Ferner Co.
Foxboro Co.
General Elec. Co.
G-M Labs.
Illinois Testing Labs.
Klipfel Mfg.
Leeds & Northrup Co.
Lewis Engg. Co.
(Cont'd)

CONTROLLERS Automatic, Pyrometric (Cont'd)
Manning, Maxwell, Moore
Mason-Neilan Regulator
Partlow Corp.
Perfex Corp.
Pyrometer Instrument Co.
Pyrometer Service Co.
Revere Corp.
Robinette Co., W. C.
Taco West Corp.
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Instrument
Uehling Instrument Co.
Wheelco Inst. Co.

CONTROLLERS, AUTOMATIC, Radio Remote
Automatic Elec. Sales
Bristol Co.
Cardwell Mfg. Co.
Collins Radio Co.
Guardian Elec. Mfg. Co.
Hastings Inst. Co.
Lewyt Metal Prod.
McFarlin Co.
Metron Instrument
Polarad Electronics
RCA Div.
Sorensen & Co.
Transmitter Equipment
Wallace & Tiernan
Yardeny Engineering Co.

CONTROLLERS, AUTOMATIC, Rate-Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Refrigeration
Allen-Bradley Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Brown Inst. Co.
Burling Instrument Co.
Cash Co.
Cutler-Hammer, Inc.
D'Este Co.
Dickson Co.
Electrimatic Corp.
Flow Controls, Inc.
Foxboro Co.
Frick Co.
Friez & Sons, Julien
Fulton Sylphon Co.
General Controls Co.
General Elec. Co.
Hammel-Dahl Co.
Illinois Engr. Co.
Lumenite Elec. Co.
Magnetrol, Inc.
Manning, Maxwell, Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercoid Corp.
(Cont'd)

CONTROLLERS, Automatic, Refrigeration (Cont'd)
Minneapolis-Honeywell
Penn Electric Switch
Perfex Corp.
Phila. Thermometer Co.
Ranco, Inc.
Refrigerating Spec. Co.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United Elec. Controls
White-Rodgers Electric

CONTROLLERS, AUTOMATIC, RKVA (See Regulators)

CONTROLLERS, AUTOMATIC, Specific Gravity (See Controllers, Automatic, Gravity)

CONTROLLERS, AUTOMATIC, Speed (See Tachometric below)

CONTROLLERS, AUTOMATIC, Stoker (See Controllers, Automatic Furnace)

CONTROLLERS AUTOMATIC, Strain-Rate & Stress-Rate
Bailey Meter Co.
Baldwin Locomotive
Hathaway Inst. Co.

CONTROLLERS, AUTOMATIC, Synchronizing (See Regulators)

CONTROLLERS, AUTOMATIC, Tachometric
Abrams Instrument
Allen-Bradley Co.
Askania Regulator Co.
Atomic Instrument
Automatic Temp. Control
Bailey Meter Co.
Barbour Stockwell Co.
Bristol Co.
Brown Inst. Co.
Burlington Inst. Co.
Cutler-Hammer, Inc.
Electric Tachometer
Foxboro Co.
General Elec. Co.
General Regulator Corp.
Hagan Corp.
Hays Corp.
Leeds & Northrup
Mason-Neilan Regulator
Metron Instrument
Moisture Register Co.
Monitor Controller Co.
Republic Flow Meters
Robinette Co., W. C.
Shallcross Controls
Varo Mfg. Co.
Westinghouse Elec.

Bailey FEED WATER Control

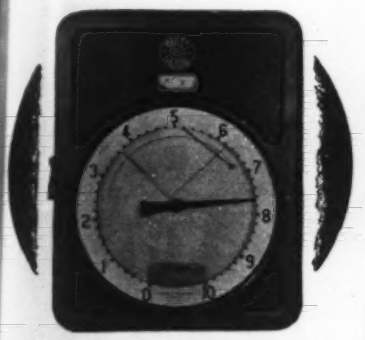
● **Bailey Meter Company offers three distinct feed water control systems. They are (1) the Thermo-hydraulic Feed Water Regulator which is suitable for the majority of small boilers operating at relatively low pressures. This regulator operates from water level alone and is provided with a fully balanced tight seating V-port regulating valve designed to give a straight line characteristic. It offers the advantages of low installation cost, removable valve parts and independence of valve location.**

(2) The Single-Element air-operated feed water control system is recommended for installations on which smooth regulation of feed water flow is desired, and a wide regulating range cannot be used. This system is controlled by water level alone as measured by a Bailey Boiler Drum Water Level Recorder.

(3) Bailey Three-Element feed water control is recommended for high capacity low water storage boilers operating at high pressures or for boilers operating at medium pressures with violent load fluctuations. This system is based on actual measurement of water flow to the boiler, steam flow from the boiler and water level within the boiler, and is adjusted primarily to control the rate of water flow to the boiler so that it equals the rate of steam flow from the boiler.

For detailed information consult Sweet's Engineering Catalogs or request bulletin ● No. 105-A.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada



BAILEY

Temperature Controller

● This BAILEY PYROTRON Electronic Resistance Thermometer indicates, records and controls temperatures between −100 F and 1200 F.

As many as four continuous temperature records may be made on a single 12-inch diameter chart. The 29-inch indicating scale is read easily at distances up to fifty feet.

Two recording controllers may be combined in one Bailey Pyrotron to save panel space. Air-operated, electric, or electronic controls are furnished as required.

Each recorder responds instantly since it is controlled by a separate measuring bridge and inertia free electronic detector. A small reversible electric motor balances the bridge and drives the indicating, recording and controlling features.

The temperature sensitive element is a platinum resistance wire wound on a mica form.

Ask for Bulletin 230-B.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd. Montreal, Canada

CONTROLLERS, AUTOMATIC, Temperature (See Pyrometric above or Thermometric below)

CONTROLLERS, AUTOMATIC, Temperature-Time (See Controllers, Automatic Thermometric; Controllers, Automatic, Thermostatic; Controllers, Automatic, Time)

CONTROLLERS, AUTOMATIC, Thermometric
American Inst. Co.
Ashcroft Auto. Cont.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Commercial Research
Dickson Co.
Douglass Automatic
Edison Electrical Controls
Electrimatic Corp.
Electro Medical Lab.
Emerson Apparatus Co.
Fisher Governor
Fish-Schurman Co.
Foster Engg. Co.
Foxboro Co.
Fulton-Sylphon
General Controls
General Elec. Co.
General Regulator Corp.
Gotham Inst. Co.
Hagan Corp.
H-B Inst. Co., Inc.
Illinois Testing Labs.
Kessler Co.
Klipfel Mfg.
Leeds & Northrup
Laboratory Const. Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Reg. Co.
McAlear Mfg. Co.
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Moore Products
Paragon Electric Co.
Parks-Cramer Co.
Partlow Corp.
Penn Ind. Inst. Corp.
Precision Therm.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Robinette Co., W. C.
Scientific Inst. Co.
(Cont'd)

CONTROLLERS, Automatic, Thermometric (Cont'd)
Spence Engineering Co.
Taco West Corp.
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Inst. Co.
Trerice Co.
United Elec. Controls
Watts Regulator Co.
Weksler Thermometer
Wheelco Inst. Co.
Wood, Harry W.

CONTROLLERS, AUTOMATIC, Thermostatic
Allen-Bradley Co.
American Inst. Co.
Accuracy Scientific Inst.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Betts & Betts
Bockel & Co.
Bristol Co.
Boiler Room Equip.
Brown Inst. Co.
Burling Inst. Co.
Cook Electric Co.
Cramer & Co., Inc.
D'Este Co.
Dickson Co.
Edison Electrical Controls
Electric Hotpack Co.
Ermstat Co.
Fenwal, Inc.
Fisher Governor
Fish-Schurman Co.
Foster Eng. Co.
Foxboro Co.
Fulton Sylphon Co.
General Controls Co.
General Elec. Co.
Gleason Avery, Inc.
Gotham Inst. Co.
Hagan Corp.
Hammel-Dahl Co.
H-B Inst. Co.
H. & H. Thermostats
Hart Mfg. Co.
Illinois Engr. Co.
Industrial Engr. Corp.
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Manning, Maxwell, Moore
Marsh Corp.
Mercoid Corp.
Minneapolis-Honeywell
Moisture Register Co.
Mu-Switch Corp.
(Cont'd)

CONTROLLERS, Automatic, Thermostatic (Cont'd)
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Phila. Thermometer Co.
Powers Regulator Co.
Precision Therm.
Ranco, Inc.
Rascher & Betzold
Republic Flow Meters
Robertshaw Thermostat
Robinette Co., W. C.
Ruggles Klingemann
Sampsel Time Control
Sarco Co., Inc.
Smith Control & Inst.
Spence Engineering Co.
Sterling Eng. Co.
Stevens Mfg. Co.
Struthers-Dunn
Tagliabue Div.
Taylor Inst. Co.
Trerice Co.
United Elec. Controls
Valverde Labs.
Vaughn-G. E. Witt Co.
Weston Elec. Inst. Corp.
White Mfg. Co.
White-Rodgers Elec. Co.

CONTROLLERS, AUTOMATIC, Time
Abrams Instrument
Allen-Bradley Co.
Am. Gas Accumulator
American Timer Corp.
Automatic Elec. Mfg. Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Betts & Betts
Bristol Co.
Brown Inst. Co.
Cincinnati Time Rec.
Clare & Co.
Controls, Inc.
Counter & Control Corp.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.
Edison Electrical Prods.
Electric Hotpack Co.
Elec. Switch Corp.
Electronic Controls
Fisher Governor
Foxboro Co.
Fredericks Co., Geo.
Friez & Sons, Julien
General Controls
General Elec Co.
Gotham Inst. Co.
Guardian Electric Mfg.
Hagan Corp.
Haydon Co., A. W.
Industrial Timer Corp.
Johnson Service Co.
Leeds & Northrup
Lumenite Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Monitor Controller Co.
National Time & Signal
Northwestern Clock Co.
Paragon Electric Co.
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Photoswitch, Inc.
Photovolt Corp.
Powers Regulator Co.
Production Instrument
Rhodes, Inc., M. H.
Rowe Radio Res.
Sampsel Time Control
Sangamo Elec. Co.
Seely Inst., Co., Inc.
Standard Elec. Time
Stromberg Time Corp.
Struthers-Dunn
Tagliabue Div.
Taylor Inst. Cos.
Telechron, Inc.
Thomas Clock Co., Seth
Thordarson Elec. Mfg.
Tork Clock Co.
Wadsworth Elec. Mfg.
Walser Automatic Timer
Ward Leonard
Wheelco Insts. Co.
White-Rodgers Elec.
Zenith Electric Co.

CONTROLLERS, AUTOMATIC, Vacuum (See Controllers, Automatic, Pressure)

CONTROLLERS, AUTOMATIC, Valve (See Valve-Operating Devices)

CONTROLLERS, AUTOMATIC, Viscosity
Bailey Meter Co.
Brabender Corp.
Brookfield Engg. Labs.
Electric Eye Equip.
Fischer & Porter
Foxboro Co.
General Controls
General Elec. Co.
Norcross Corp.
Perfex Corp.
Scientific Inst. Co.
Taylor Inst. Co.
Visco-Meter Corp.

CONTROLLERS, AUTOMATIC, Voltage (See Regulators)

CONTROLLERS, AUTOMATIC, Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Water Level (See Controllers, Automatic, Liquid Level)

CONTROLLERS, MANUAL (Non-automatic), Field
Allis-Chalmers
Automatic Elec. Mfg.
Betts & Betts
Cutler-Hammer, Inc.
General Controls
General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Ward Leonard Elec. Co.
Westinghouse Elec.

CONTROLLERS, MANUAL (Non-automatic), Hydraulic
Cash Co.
General Controls
Hagan Corp.
Hammel-Dahl Co.
Hydraulic Controls
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.

CONTROLLERS, MANUAL (Non-automatic) Motor
Allen-Bradley Co.
Allis-Chalmers
Automatic Elec. Mfg.
Betts & Betts
Cutler-Hammer, Inc.
Furnas Electric Co.
General Controls
General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Superior Electric Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Wilson & Co.

CONTROLLERS, MANUAL (Non-automatic Rheostatic)
Allen-Bradley Co.
Beck Bros.
Cutler-Hammer, Inc.
General Controls
General Elec. Co.
Mallory & Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Rubicon Co.
Ward Leonard Elec. Co.
Westinghouse Elec.

CONTROL SYSTEMS (See Controllers, Automatic)

COUNTERS, Alarm
Adde & Co.
Cook Electric
Durant Mfg. Co.
Flett Laboratory
Martin-Hubbard Corp.
Potter Instrument
Rowe Radio Research

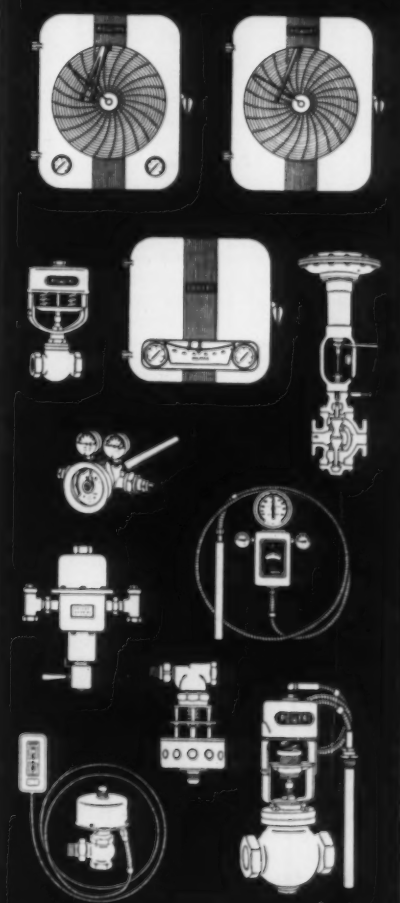
COUNTERS, Colony
American Optical
Central Scientific
Fisher Scientific Co.
Sargent & Co.
Thomas Co., Arthur H.

COUNTERS, Cycle
Automatic Elec. Sales
Automatic Temp. Control
Bristol Co.
Brush Development
Cook Electric
Counter & Control Corp.
Cyclotron Specialties Co.
Foxboro Co.
General Elec. Co.
Gorrell & Gorrell
Hewlett-Packard Co.
Martin-Hubbard Corp.
Paragon Electric Co.
Potter Instrument
Raytheon Mfg. Co.
Rowe Radio Research
Standard Elec. Time Co.
States Co.
Telechron, Inc.
Westinghouse Elec.

COUNTERS, Footage
Adde & Co.
Avion Instrument
Bristol Co.
Cook Electric
Counter & Control Corp.
Durant Mfg. Co.
Elec. Tachometer Corp.
McDonnell Odometer Co.
Potter Instrument
Tally Meter Co.
Veeder-Root, Inc.

COUNTERS, Geiger-Muller
Atomic Instrument
Ballantine Labs.
Berkeley Scientific
Cambridge Inst. Co.
Canadian Radium
Cyclotron Specialties
Distillation Products
Flett Laboratory
General Radio Co.
Geophysical Instrument
Herbach & Rademan
Inst. Development Labs.
National Tech. Labs.
North Amer. Philips
Potter Instrument
Radiation Counter Labs.
Stoeiting Co., C. H.
Sylvania Elec. Prod.
Technical Associates
Tracerlab, Inc.
Vacutron, Inc.
Victoreen Instrument Co.
Welch Mfg. Co.

POWERS
TEMPERATURE and HUMIDITY CONTROL



When you want accurate and dependable automatic temperature or humidity control for Industrial Processes, Heating or Air Conditioning Systems, call in a Powers engineer. With over 50 years of experience and a very complete line of self-operating and air operated controls we are well equipped to fill your requirements.

Write for Circular 2520
2734 Greenview Ave., Chicago
Offices in 47 Cities—See your phone directory.

THE POWERS REGULATOR CO.

Instruments... for **nuclear research**

MODEL 161 SCALER

Built-in high voltage supply, rapid circuit reaction, reliable operation even with wide variations of line voltage, facilities for timing clock and external register, and simplicity of operation make this scaler suitable for use in all types of research or routine counting work. Predetermined time and count features also available.

MODEL 2610 PORTABLE COUNT RATE METER

This radioactivity survey meter is completely self-contained and easily portable. (Weight only 9½ lbs.) Complete with meter and earphones.

MODEL 3040 POCKET METER

Lightweight, pocket-size meter for recording the amount of radiation to which its wearer has been subjected. Durable and not easily subject to damage. Extremely insensitive to shock. Constructed of sturdy, attractive plastic material.

ACCESSORIES

A complete line of tubes, quench circuits, counters, shields, and other accessories is available. Special products can also be manufactured to meet your needs.

idl

Designers and BUILDERS of INTEGRATED EQUIPMENT

INSTRUMENT DEVELOPMENT LABORATORIES

Chicago, Illinois

COUNTERS, Hour
Automatic Temp. Control
Cramer & Co., Inc.
Elec. Tachometer Corp.
General Elec. Co.
Haydon Co., A. W.
Paragon Electric Co.
Rowe Radio Research
Standard Elec. Time
Telechron, Inc.
Westinghouse Elec.
Weston Elec. Inst. Corp.

COUNTERS, Lumber
Adde & Co.
Durant Mfg. Co.
Keuffel & Esser Co.
McDonnell Odometer Co.
Moisture Register Co.
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Rowe Radio Research
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Sticht Co.
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Weston Electrical Inst.
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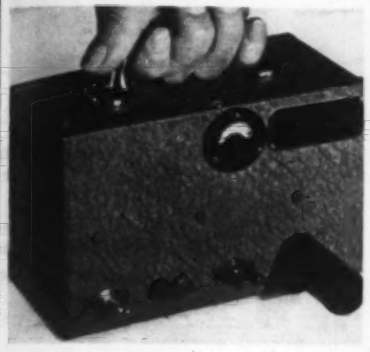

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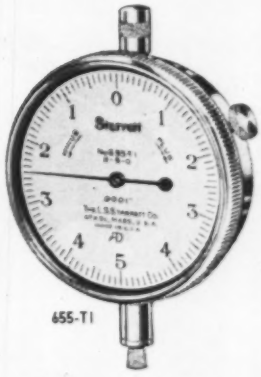

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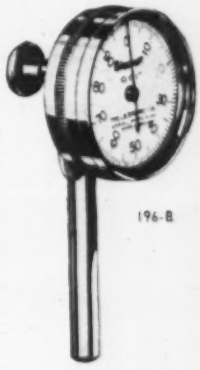

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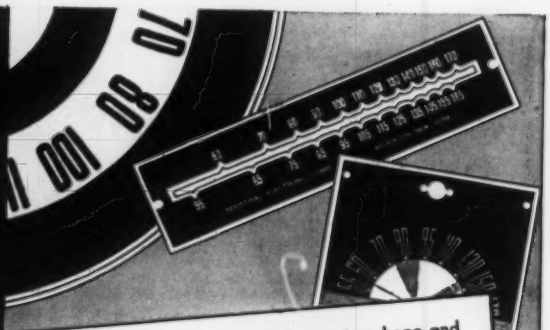

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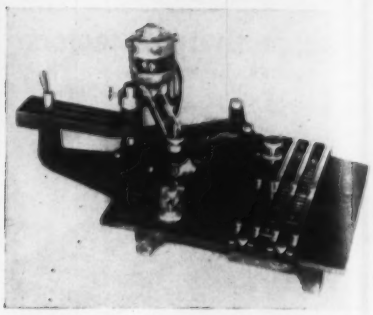

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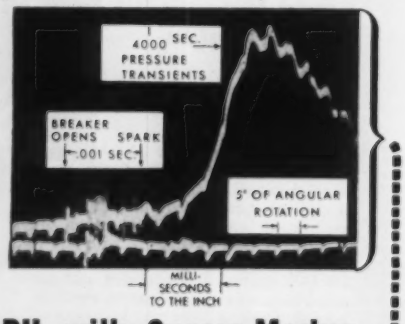

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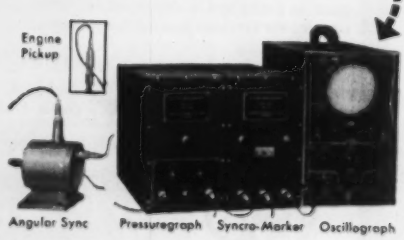

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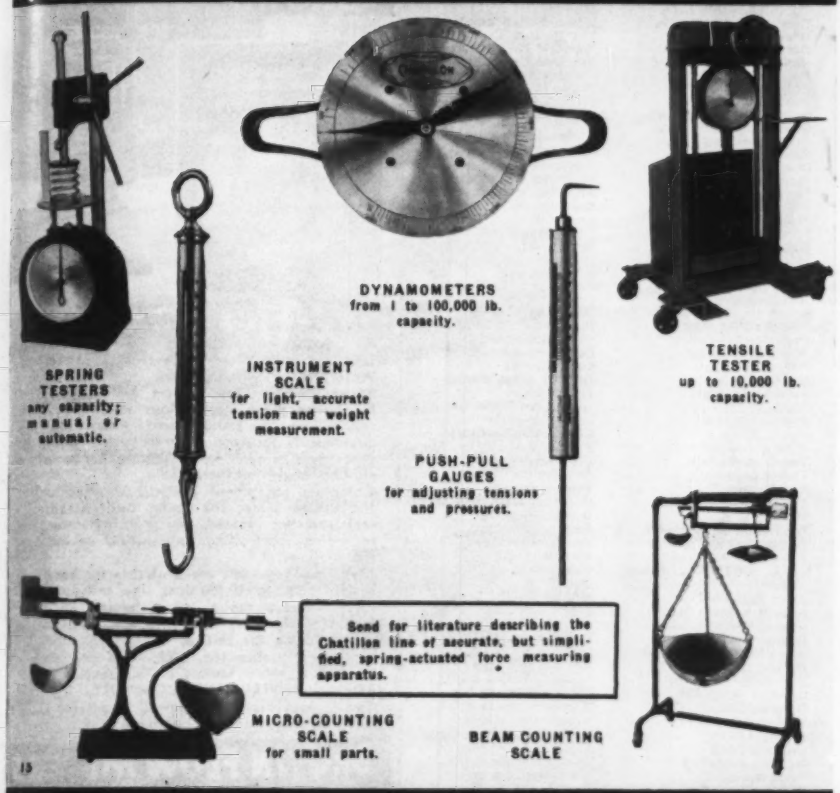

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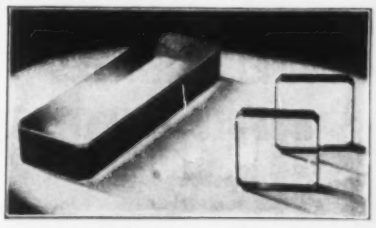

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Olsen Testing Machine
Schaevitz Engineering
Statham Labs.
Swedish Gage

EYEGLASSES, POLARIZED (for Photoelastic Work or Strain Observation, etc.)
Polarizing Inst. Co.
Zeiss, Inc., Carl

FADING TESTER
Atlas Elec. Devices Co.
Gen. Elec. Vapor Lamp

FAULT LOCATORS
Audio-Tone Oscillator
Automatic Elec. Sales
Industrial Insts., Inc.
Leeds & Northrup
Rawson Elec. Inst. Co.
Raytron, Inc.
Rubicon Co.
Shallcross Mfg. Co.
Tobe Deutschmann Corp.
Westinghouse Elec.

FEED WATER METERS
Bailey Motor Co.
Brown Inst. Co.
Builders-Providence
Central Station Steam Elec. Indicator Co.
Fischer & Porter
Foxboro Co.
Hagan Corp.
Henszey Co.
Leeds & Northrup
Mason-Neilan Regulator
Republic Flow Meters
Simplex Valve & Meter
Tagliabue Div.

FEED WATER TESTING APPARATUS
Allis-Chalmers
Burrell Technical Supply
Central Scientific Co.
Electronic Products Co.
Hagan Corp.
Hellige, Inc.
Industrial Insts., Inc.
LaMotte Chemical Prod.
Leeds & Northrup Co.
Pale-Myers
Pfaltz & Bauer, Inc.
Photovolt Corp.
Taylor & Co., W. A.

FEEDERS, Automatic, Proportioning
Automatic Temp. Control
Bowser & Co., S. F.
Builders-Providence
Everson Mfg. Co.
Fischer & Porter
General Controls
Henszey Co.
Infilco Co.
McDonnell & Miller
Merrick Scale
(Cont'd)

FEEDERS, Automatic, Proportioning (Cont'd)
Milton Roy Pumps
Omega Machine
Permutit Co.
Proportioneers, Inc.
Schaffer Poidometer
Wallace & Tiernan
Watts Regulator Co.

FEEDERS, Automatic, Granular Material
Builders-Providence
Infilco Co.
Merrick Scale
Omega Machine
Permutit Co.
Proportioneers, Inc.
Wallace & Tiernan

FIELD RHEOSTATS (See Rheostats, Field)

FIELD-STRENGTH MEASURING SETS
Clarke Insts. Corp.
Federal Telegraph Co.
Ferris Inst. Corp.
General Elec. Co.
McFarlin Co.
Measurements Corp.
Panoramic Radio Co.
RCA Div.
Sherron Metallic
Tobe Deutschmann Corp.
Waugh Labs.

FILLING MACHINES, Automatic
All Amer. Tool & Mfg.
Allis-Chalmers
Anderson Bros. Mfg. Co.
Bowser & Co.
Gump Co., B. F.
Potter Instrument
Proportioneers, Inc.
Richardson Scale Co.
Triangle Package Mach.

FILTERS, Light (See also Filters, Optical)
American Inst. Co.
Baird Associates
Bausch & Lomb Opt.
Central Scientific Co.
Corning Glass Works
Crystal Research Labs.
Dearborn Scientific
Fish-Schurman Co.
Fuess, Inc.
Goerz Amer. Optical Co.
Kollmorgen Optical Co.
Leitz, Inc.
Mogey & Sons
Perkin-Elmer Corp.
Zeiss, Inc., Carl

FILTERS, Optical
Baird Associates
Bausch & Lomb Optical
Binswanger & Co.
Boehmke Optical Co.
Crystal Research Labs.
Dearborn Scientific
Eastman Kodak Co.
Electronic Laboratory
Fecker, J. W.
Fish-Schurman
General Scientific Corp.
Geophysical Inst. Co.
Goerz Amer. Optical Co.
Hayward Optical Glass
Henson Co., Fred C.
Klett Mfg. Co.
Mico Instrument Co.
Mogey & Sons
Palos Optical Co.
Perkin-Elmer Corp.
Pfaltz & Bauer, Inc.
Photovolt Corp.
Pyrometer Inst. Co.
Rubicon Co.
Schneider-Cogswell
Testrite Instrument Co.
Triumph Mfg. Co.
Unertl Optical Co.
Univis Lens Co.

FINDERS, Valve Box
Geophysical Inst. Co.
Wilder, R. S.

FIRE CONTROL INSTRUMENTS, MILITARY & NAVAL
Arma Corporation
Bausch & Lomb
Bell & Howell Co.
Elec. Indicator Co.
Fecker, J. W.
General Elec. Co.
Kollmorgen Optical Co.
Martin-Hubbard Corp.
Perkin Elmer Corp.
Robinette Co., W. C.
Sperry Gyroscope Co.
Unertl Opt. Co.

FIRING DISKS
Veritas Firing System

FLASH POINT TESTERS (See Testers, Flash Point)

FLATNESS TESTERS (See Testers, Flatness, Light Wave)

FLATS, OPTICAL
Acme Industrial
American Optical
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
(Cont'd)

FLOW RATE METER ELIMINATES "BUBBLE COUNTING"

This compact flow meter is the answer to purge line (Bubbler) control installation.

. . . true purge rate indication
. . . easily and neatly panel mounted singly or in multiple, requires a minimum of space.
. . . furnished with or without needle control valve.

$9.00 per unit, without control valve (lower price when purchased in quantity).

Write for catalog 31

LABORATORY FLOW RATE METER

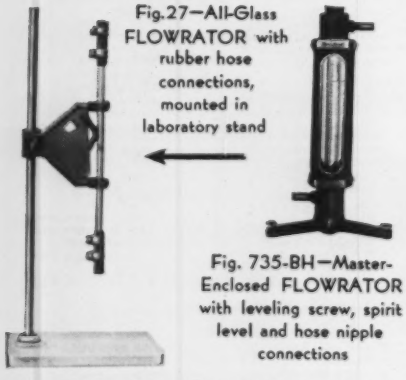


Fig.27—All-Glass FLOWRATOR with rubber hose connections, mounted in laboratory stand

Fig. 735-BH—Master-Enclosed FLOWRATOR with leveling screw, spirit level and hose nipple connections

The F & P FLOWRATOR, variable area type flow meter, permits an instantaneous reading of the true flow rate. Each instrument is accurately calibrated at our factory for your exact requirements.

Liquid flows down to 0.15 cc per min. and gas flows down to 3.0 cc per min. can be measured with ease. All-glass meters are now sold at EVEN LOWER prices than prevailed during the war.

Write for catalog 32

FLOWRATOR
TRADEMARK
FISCHER & PORTER CO.
DEPT. 7X-5C HATBORO, PENNA.

FLATS, Optical (Cont'd)
Binswanger & Co.
Buchele Optical Co.
Clark & Sons
Crystal Research Labs.
Dearborn Scientific Co.
Dome Precision
Ednal Co.
Fecker, Inc.
Ferner Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
General Scientific Corp.
Geophysical Inst. Co.
Glendale Optical
Goerz Amer. Optical Co.
Henson Co., Fred C.
Jarrell-Ash Co.
Kollmorgen Optical Co.
Master Optical Co.
Mico Instrument Co.
Miller Corp., William
Mogey & Sons
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Scherr Co., Inc., George
Phoenix Prec. Inst.
Plummer & Kershaw
Pratt & Whitney
Robinson Optical
Ruska & Co.
Schneider-Cogswell
Sheffield Corp.
Simpson Optical
Swain Nelson Co.
Tinsley Laboratories
Unertl Optical Co.
Univis Lens Co.
Van Keuren Co.
Vinco Corp.
Wilder, R. S.
Woermann-Schuchhardt
Zenith Optical Co.
Zeiss, Inc., Carl

FLATS, OPTICAL, Fused Quartz
Acme Industrial
Bausch & Lomb Opt.
Crystal Research Labs.
Dearborn Scientific
Dome Precision
Fecker, Inc.
Fish-Schurman Corp.
Gaertner Scientific
Geophysical Inst. Co.
Henson Co., Fred C.
Jarrell-Ash Co.
Mogey & Sons
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Plummer & Kershaw
Scherr Co., Inc.
Thermal Syndicate Ltd.
Tinsley Laboratories
Unertl Optical Co.
Van Keuren Co.

FLIGHT TEST INSTRUMENTS
Electronic Associates
Federal Telegraph Co.
Gannon Co.
General Elec. Co.
Globe Industries
Hathaway Instrument
Heiland Research
Impact Register
Lewis Engineering
M. B. Mfg. Co.
Revere Corp.
Sperry Gyroscope Co.
Statham Labs.
Televiso Products
Waugh Labs.

"FLOW"

(Flowmeters measure primarily RATE of flow. For positive or "quantity" fluid meters, see the numerous classes under "Meters")

FLOWMETERS, AIR (See Flowmeters, Gas)

FLOWMETERS, AREA Cone & Disk Type
Commercial Research
Fischer & Porter
Friez & Sons
Hays Corp.
National Meter Co.

FLOWMETERS, AREA Cylinder & Piston Type
American Inst. Co.
Bowser & Co.
Brown Inst. Co.
Fischer & Porter
National Meter Co.
New Jersey Motor Co.

FLOWMETERS, AREA, Free Float Type
Brooks Rotameter
Commercial Research
D'Este Division
Fischer & Porter
Fish-Schurman Corp.
Hammel-Dahl Co.
Hays Corp.
Hoke, Inc.
Mercury Glass Co.
Penn. Ind. Inst. Corp.
Phoenix Prec. Inst.
Schutte & Koerting Co.

FLOWMETERS, AREA, Orifice & Plug Type
American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Fischer & Porter
(Cont'd)

FLOWMETERS, Area, Orifice & Plug Type (Cont'd)
Hays Corp.
Henszey Co.
Mason-Neilan Regulator
Meriam Inst. Co.
Republic Flow Meters
Robinson Orifice
Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Instrument

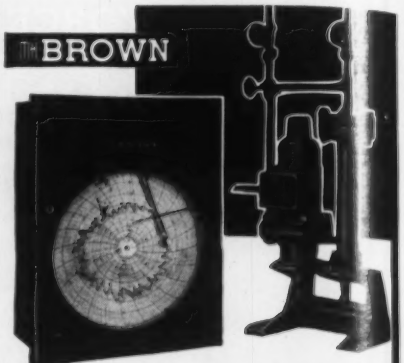
FLOWMETERS, BLAST (See Flowmeters, Gas)

FLOWMETERS, GAS
Ace Glass, Inc.
American Dist. Steam
American Inst. Co.
American Meas. Insts.
American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bowser & Co.
Bristol Co.
Brooks Rotameter
Brown Inst. Co.
Builders-Providence
Clark Blast Meter
Commercial Research
Cook Electric
Corning Glass Works
D'Este Co.
Detroit Air Meter Co.
Eclipse-Pioneer Div.
Elec. Indicator Corp.
Fischer & Porter
Fish-Schurman Co.
Foxboro Co.
Friez & Sons
Gas Appliance Specialties
General Elec. Co.
Hagan Corp.
Hastings Inst. Co.
Hays Corp.
Henszey Co.
Hoke, Inc.
Illinois Testing Labs.
Inst. Development Labs.
International Filter Co.
Kollsman Inst. Co.
Lambert Meter Co.
Leeds & Northrup
Leupold, Volpel & Co.
Linde Air Products
Mason-Neilan Regulator
Meriam Co.
Moore Products
National Meter Co.
New Jersey Meter Co.
Northwest Instrument
Penn Ind. Inst. Corp.
Phoenix Prec. Inst.
Pitometer Log Corp.
Precision Scientific
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Schutte & Koerting Co.
Scientific Glass Apparatus
Selas Company
Simplex Valve & Meter
Statham Labs.
Superior Meter Co.
Tagliabue Div.
Taylor Inst. Cos.
Trimount Instrument
U. S. Gauge

FLOWMETERS, LIQUID (See Flowmeters, Gas)

FLOWMETERS, Open-Stream
Bailey Meter Co.
Bristol Co.
Builders-Providence
Foxboro Co.
Hagan Corp.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Scientific Inst. Co. Calif.
Simplex Valve & Meter
Westberg Mfg. Co.
White Co.

FLOWMETERS, Orifice, and Nozzle
Ace Glass, Inc.
American Dist. Steam
American Meter Co.
Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Campbell Co., J. A.
Commercial Iron Works
Corning Glass Works
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
Hoke, Inc.
Lambert Meter Co., Inc.
Leeds & Northrup Co.
Leupold & Stevens
Mason-Neilan Regulator
Meriam Co.
Moore Products
Penn Ind. Inst. Corp.
Permutit Co.
Refinery Supply Co.
Republic Flow Meters
Robinson Orifice
Schutte & Koerting
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Tagliabue Div.
Taylor Inst. Cos.
Trimount Instrument



ELECTRIC FLOW METERS

For Recording, Indicating, Totalizing and Controlling the flow of fluids such as Steam, Water, Gas, Oil, etc.

Brown Electric Flow Meters are unsurpassed for power plant applications where accurate results are paramount and where the instrument is located away from the point of flow measurement, or where presence of a stuffing box is objectionable.

Complete equipment consists of three units: the orifice plate, the meter body (transmitter) and the receiver which incorporates the recording, controlling, integrating or indicating features.

Meter body models are available for handling from 2 lbs. to 10,000 lbs. line pressure. Interchangeable range tubes furnish an easy means of changing the instrument range without removing the orifice.

Send for catalog No. 2008. Also see Brown Mechanical Flow Meters in this section. THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

BROWN FLOW METERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS

New Jersey Air Meters

TOOL-OM-ETER and DRILL-OM-ETER

Measure the flow of Compressed Air to any process or tool. Guide the Maintenance of pneumatic equipment in effective working condition.

These meters are of the constant head, variable orifice type, simple, reliable, portable, only one moving part. Used on air and other gases at 1-300 lb.

New Jersey Meter Co.
PLAINFIELD, N. J.

This New Bulletin tells all about Ring Balance Meters ... a product of HAGAN CORPORATION

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To get your copy, just fill in and mail the coupon

HAGAN CORPORATION

METALLURGICAL FURNACE CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
BOILER COMBUSTION CONTROL SYSTEMS

HAGAN CORPORATION
HAGAN BUILDING
PITTSBURGH 30, PA.

Please send me your Ring Balance Meter Bulletin 2M47.

NAME

POSITION

COMPANY

STREET AND NUMBER

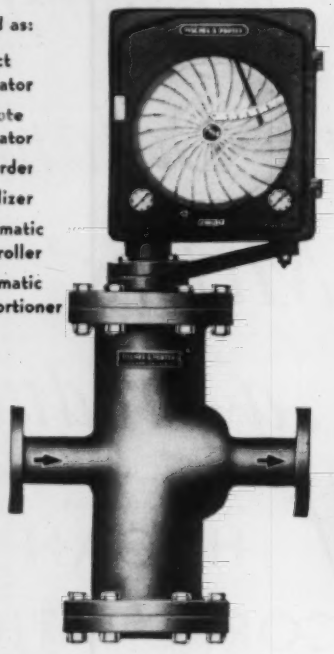
POST OFFICE ZONE NO. STATE

ARMORED FLOWRATOR

FOR TOUGH FLOW MEASUREMENT PROBLEMS

Supplied as:

1. Direct Indicator
2. Remote Indicator
3. Recorder
4. Totalizer
5. Automatic Controller
6. Automatic Proportioner



The F. & P. FLOWRATOR instrument (formerly called Rotameter) is now available for any pressure or temperature and for large flow rates in the new armored "valve-body" design having no glass parts exposed to operating pressure differential.

It uses magnetic, electric or electronic transmission systems. With the electronic system it can record and control flows down to fractions of a cc per minute, is continuously self-balancing, travels full scale in less than 3 seconds, uses no slide wire.

The automatic proportioner arrangement, due to its linear chart scale, eliminates the range restrictions and coordinates difficulties inherent in variable head (orifice) type proportioning installations.

PRICES NOW REDUCED TO LESS THAN WAR-TIME PRICES

For detailed information send for:

Catalog 40—Armored meter

Catalog 50—Electric and magnetic remote instrument

Catalog 52—Electronic recording instrument

FLOWRATOR
TRADEMARK
FISCHER & PORTER CO.
DEPT. 7X-5C HATBORO, PENNA.

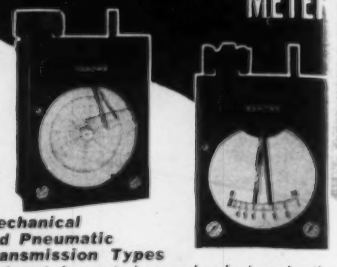
FLOW METERS

● The Type H illustrated is an extremely accurate indicating instrument for measuring the flows of gases or liquids when operating pressures do not exceed 250 lbs. per sq. in. and the differential pressure does not exceed 160 inches of water pressure. Wall or Panel Mounting. Direct reading scales to meet any requirement. Also Inclined Tube types—for low differential ranges of 25" or 49" of water. Fully descriptive catalog sent on request.

THE MERIAM INSTRUMENT CO.
10938 MADISON AVENUE
CLEVELAND 2, OHIO

Manometers, Meters, and Gauges for the accurate measurement of Pressures, Vacuums and Flows of Liquids and Gases.

FLOW AND LIQUID LEVEL METERS



Mechanical and Pneumatic Transmission Types

Designed for petroleum, chemical and other process industries, the Brown Mechanical Flow Meter provides an accurate and dependable means of handling any flow measurement or control problem. Interchangeable range tubes provide an easy means of changing the instrument without removing the orifice.

Brown Mechanical Flow Meters are used where it is convenient to locate the instrument close to the point of flow measurement. The meter body is mounted on the back of the instrument case and is connected to the instrument through a pressure-tight bearing.

Brown Pneumatic Transmission Type Flow Meters are used in hazardous atmosphere or where it is desired to transmit flow readings to a remote point. A unique matched bellows system provides unparalleled accuracy in transmission. All styles with or without air control feature. Send for catalog 2221. Also see Brown Electric Flow Meters in this section.

THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

BROWN INSTRUMENTS
AND
MINNEAPOLIS HONEYWELL CONTROL SYSTEMS

FLOWMETERS, Pitot Tube
Am. Blower Corp.
American Meter Co.
Askania Regulator Co.
Avion Instrument
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Ellison Draft Gage Co.
Foxboro Co.
Friez & Sons
Fuess, Inc.
Hagan Corp.
Hays Corp.
Illinois Testing Labs.
Kollsman Inst. Co.
Leupold & Stevens
Meriam Co.
Morey & Jones, Ltd.
Pitometer Log Corp.
Precision Therm. & Inst.
Precision Tube Co.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Instrument

FLOWMETERS, Steam
Am. Dist. Steam Co.
American Meter Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
Leeds & Northrup Co.
Mason-Neilan Regulator
Meriam Co.
Moore Products
Penn Ind. Inst. Corp.
Republic Flow Meters
Simplex Valve & Meter
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst.

FLOWMETERS, Vane
Autocall Co.
Detroit Air Meter Co.
Eclipse-Pioneer Div.
Friez & Sons
Hays Corp.
Illinois Testing Labs.
Mason-Neilan Regulator
Simplex Valve & Meter

FLOWMETERS, Venturi Type
American Meter Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Eclipse-Pioneer Div.
Foxboro Co.
Gauther, Donat A.
Hagan Corp.
Hays Corp.
Infilco, Inc.
International Filter Co.
Leeds & Northrup
Leupold & Stevens
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
U. S. Gauge

FLOWMETERS, Weir
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Elec. Indicator Corp.
Fischer & Porter
Foxboro Co.
Gurley, W. & L. E.
Hagan Corp.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.

FLUE GAS ANALYZERS See Gas Analyzers, Flue Gas)

FLUID METERS, GAS (See Gas Meters)

FLUID METERS, LIQUID (See Meters, Liquid)

FLUID METERS, QUANTITY (See Gas Meters; Meters, Current; Meters, Liquid)

FLUORESCENT MERCURY VAPOR TUBES EMITTING WHITE LIGHT (See Light Sources)

FLUOROMETERS
Coleman Electric
National Tech. Labs.

FLUOROSCOPES
General Electric X-Ray
Kelley-Koett
Patterson Screen Div.
Westinghouse X-Ray Co.

FLUXMETERS
Annis Co.
Cambridge Inst. Co.
Central Scientific Co.
Clarke Inst. Corp.
General Elec. Co.
Leeds & Northrup Co.
Marion Electrical Inst.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Stieht Co.

FOLDING ENDURANCE TESTERS (PAPER) (See Testers, Folding Endurance)

FOOT BLOCKS
Ford Motor Co.

FOOT CANDLE METERS
Central Scientific Co.
De Jur-Amsco Corp.
General Elec. Co.
G-M Labs.
Hickok Elect. Inst.
M B Mfg. Co.
Pfaltz & Bauer, Inc.
Photovolt Corp.
Triplett Elec. Inst.
Welch Scientific
Weston Elec. Inst. Corp.

FOREWARN DETECTOR, for locating hidden weapons (See Detectors, Metal)

FORKS, Synchronization
American Time Prods.
Elec. Tachometer Corp.
Gaertner Scientific Corp.
Kurman Electronics
Leeds & Northrup
MacLeod & Hanopol
Riverbank Laboratories
Times Facsimile Corp.

FORKS, Tuning
American Time Prods.
Bunnell Co., J. H.
Clay-Adams Co.
Gaertner Scientific
Goetze Niemer Co.
Hathaway Instrument
Heiland Research
Times Facsimile Corp.

FORKS, Tuning, Electrically Driven
American Inst. Co.
American Time Prods.
Bunnell Co., J. H.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Electronic Prod. Co.
Elec. Tachometer Corp.
Engineering Labs., Inc.
Gaertner Scientific Corp.
General Radio Co.
(Cont'd)

FORKS, Tuning, Electrically Driven (Cont'd)
Gibbs & Co.
Hathaway Inst. Co.
Leeds & Northrup
Metron Instrument
Riverbank Laboratories
Sherron Metallic
Stoelting Co., C. H.
Times Facsimile Corp.
Varo Mfg. Co.
Welch Mfg. Co.

FORKS, Vacuum Driven
Cambridge Inst. Co.
Gaertner Scientific Corp.
General Radio
Riverbank Laboratories

FRACTIONAL HORSEPOWER MOTORS (See Motors, Fractional Horsepower)

FREENESS TESTERS (See Testers, Freeness)

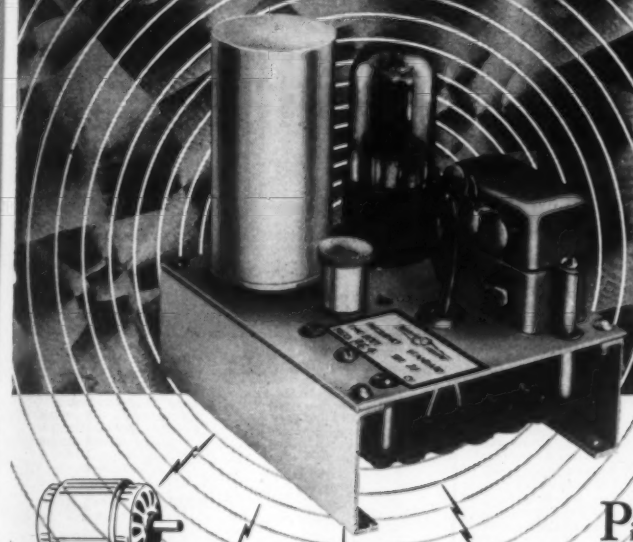
FREQUENCW METERS, Controlling
General Elec. Co.
Kellogg Switchboard
Leeds & Northrup Co.

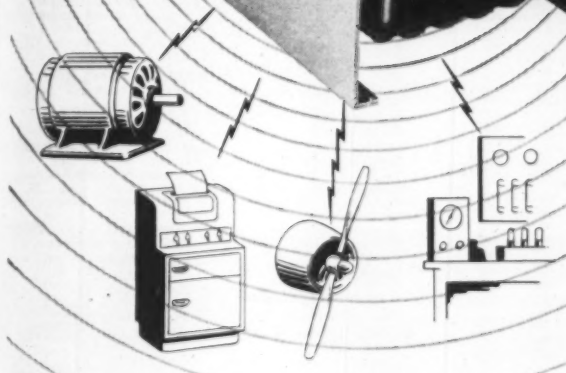
FREQUENCY Meters, Electronic
Browning Labs.
Cardwell Mfg. Co.
Clarke Inst. Corp.
Cole Instrument
Daven Co.
De Jur-Amsco Corp.
Electronic Dev. Lab.
Electro Products Lab.
General Elec. Co.
General Radio Co.
Harvey Radio Labs.
Hastings Inst. Co.
Hewlett Packard Co.
Knights Co.
Lampkin Lab.
Lavoie Laboratories
Metron Instrument
Millen Mfg. Co.
Potter Instrument
RCA Div.
Rowe Radio Research
Sherron Metallic

FREQUENCY METERS, Indicating
Biddle Co.
Burlington Inst. Co.
Doolittle Radio
Electro-Tech Equip.
Electronic Engineers
General Elec. Co.
General Radio Co.
Hagedorn Engineering
Hastings Inst. Corp.
Hathaway Instrument
(Cont'd)

PICK A NUMBER

ANY FREQUENCY FROM 40 TO 1,000





Pictured here is a tuning-fork frequency standard with accuracy guaranteed to one part per million per degree Centigrade. The fork is temperature-compensated and hermetically sealed against variations of barometric pressure. This standard, when combined with basic equipment, facilitates accurate speed and time control by mechanical, electrical, acoustical or optical means.

The unit is available separately or in conjunction with complete timing instruments. Our engineers are ready to cooperate on any problem.

MOTORS · FACSIMILE · AIRCRAFT · LABORATORIES

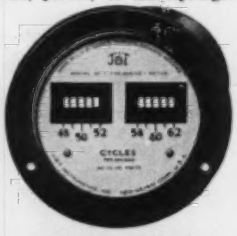
American Time Products Inc.

580 Fifth Avenue

WESTERN ELECTRIC COMPANY

VIBRATING REED FREQUENCY METERS

When it is important to know the frequency of AC or interrupted DC, J-B-T vibrating reed frequency meters give you these advantages: (1) Accuracy, ±0.3% to ±0.2%, depending on model; (2) freedom from errors caused by wave forms, external magnetic fields, and normal temperature changes; (3) rugged dependability, because they have no jewels, pivots, or mainsprings.



Line covers frequencies from 15 to 550 cy., various voltages, reed groupings and case sizes. Standard models stocked by many leading electronic parts distributors. Ask for bulletins.

(Manufactured under Triplett Patents and/or Patents Pending)

J-B-T *Products*

Vibrating Reed Frequency Meters . . . Pyrometers . . . Potentiometer-Pyrometers . . . Resistance Thermometers . . . Appliance Temperature Testers . . . Thermocouples and Accessories . . . Reed Tachometers . . . Galvanometers . . . Selector Switches . . . Gas Pilot Safety Switches . . . and other Instruments and Testers.

J-B-T INSTRUMENTS, INC.

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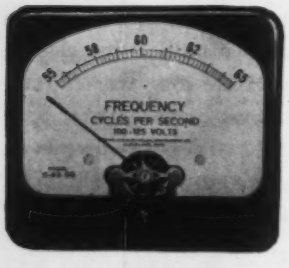
HIGHEST HICKOK ACCURACY



Frequency Meters

Available in 4" rectangular panel mounting case—other sizes up to 6" case—entirely self-contained—*no external reactor* . . . Overall accuracy is better than .2 of a cycle in 60 cycles . . . Made with 55 to 65 cycle reading but also available in 59-61 cycle for greater reading accuracy and other ranges of frequency . . . Indication by pointer and graduated scale, easy to read . . . Vibration-proof and shock-proof . . . Damping can be adjusted to suit extreme conditions of frequency variation . . . Accurate within ambient temperature range from minus 10 to plus 40 degrees C . . . Power consumption only 0.8 watts at 115 volts.

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HICKOK

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FREQUENCY METERS, Indicating (Cont'd)
Hickok Elec. Inst. Co.
J-B-T Instruments
Kellogg Switchboard
Leeds & Northrup Co.
Metron Instrument
RCA Div.
Roller-Smith Co.
Sensitive Research Inst.
Sheffield Corp.
Sperry Gyroscope Co.
Standard Elec. Time
Thordarson Elec. Mfg.
Varo Mfg. Co.
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

FREQUENCY METERS, Microwave
Sperry Gyroscope Co.
Sylvania Elec. Prod.

FREQUENCY METERS, Recording
Bristol Co.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Metron Instrument
Roller-Smith Co.
Sheffield Corp.
Sound Apparatus
Telechron, Inc.
Westinghouse Elec.

FREQUENCY METERS, Standards
American Time Prods.
Bliley Electric Co.
Browning Labs.
Crystal Research Labs.
Doolittle Radio
Electronic Dev. Lab.
Ferris Inst. Corp.
General Electric Co.
General Radio Co.
Hathaway Instrument
Hewlett-Packard
Knights Co.
Lavoie Laboratories
Millen Mfg. Co.
Western Electric

FREQUENCY METERS, Vibrating Reed
Aero Instrument Co.
Biddle Co., Jas. G.
Furst Electronics
Hagedorn Engineering
J-B-T Insts., Inc.
Triplett Elec. Inst.

FREQUENCY MONITORS
General Radio Co.
Hewlett-Packard
Lampkin Laboratories
RCA Div.
Sylvania Elec. Prod.

FREQUENCY RESPONSE RECORDERS, Automatic
Audio-Tone Oscillator
General Elec. Co.
Martin-Hubbard Corp.
Sound Apparatus Co.

FRITTED GLASS FILTERS & APPARATUS
Central Scientific Co.
Corning Glass Works
Fischer & Porter
Fish-Schurman Co.
Microchemical Service
Mine Safety App. Co.
Pfaltz & Bauer, Inc.
Phoenix Prec. Inst.
Scientific Glass App.

FUEL ANALYSIS APPARATUS
American Inst. Co.
Burrell Tech. Supply
Central Scientific Co.
Machlett & Son
Parr Instrument Co.
Precision Scientific Co.
Proportioneers, Inc.
Sargent & Co.
Tagliabue Mfg. Co.

FUEL FLOW INDICATORS
Askania Regulator Co.
Autocall Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brooks Rotameter
Brown Inst. Co.
Builders-Providence
Commercial Research
Eclipse-Pioneer Div.
Fischer & Porter
Foxboro Co.
General Elec. Co.
Hastings Inst. Co.
Hays Corp.
Mason-Neilan Regulator
National Airoil Burner
Revere Corp.
Schutte & Koerting
Selas Co.
Statham Labs.
Tagliabue Div.
Taylor Inst. Cos.
Technicraft Indicators

FURNACE CONTROL SYSTEMS (See Controllers, Automatic)

FURNACES, LABORATORY, HIGH TEMPERATURE
American Instrument Co.
Burrell Tech. Supply
Central Scientific
Dietert Co.
Electric Hotpack Co.
Ferner Co.
Fisher Furnace Co.
Gordon Co., Claud S.
Huppert Co.
Johnson Gas Appliance
Laboratory Equipment
Lindberg Engineering Co.
Machlett & Son
Marshall Co., L. H.
National Airoil
Precision Scientific
R-S Prod. Corp.
Selas Co.
Shallcross Controls
Surface Combustion
Thermo Elec. Mfg. Co.
Thomas Co., Arthur H.

FURNITURE, LABORATORY
Aloe Co., A. S.
Hamilton Mfg. Co.
Kewaunee Mfg. Co.
Laboratory Const. Co.
Laboratory Furniture Co.
Lewyt Metal Prod.
Moline Furniture Works.
Sheldon & Co.
Sjostrom Co.
Southern Desk Co.
Welch Scientific

FUSES, INSTRUMENT
Grammes & Sons, L. F.
Kellogg Switchboard
Littlefuse, Inc.
Meter Devices Co.

GAGE BLOCKS
Dearborn Gage Co.
Dearborn Scientific
DoAll Co.
Fonda Gage
Ford Motor Co.
Illinois Tool Works
Jansson Gage Co.
Lincoln Park Tool
Pratt & Whitney
Precision Scientific
Scherr Co., George
Standard Gage Co.
Swedish Gage
Van Keuren Co.
Webber Gage Co.

GAGE BLOCKS, Angle
Webber Gage Co.

GAGE BLOCKS, Surface Finish
Surface Checking Gage

GAGE GLASS ILLUMINATORS
Jerguson Gage & Valve
National Co.

GAGE TESTERS, Deadweight
American Inst. Co.
Amthor Testing Inst. Co.
Ashton Valve Co.
(Cont'd)

GAGE TESTERS, Weight (Cont'd)
Crosby Steam Gage Co.
Gordon Co., Claud S.
Grove Regulator
Manning, Maxwell & Moore
Mansfield & Green
Olsen Testing Machine
Pioneer Instrument
Precision Scientific
Refinery Supply Co.
Ruska Inst. Corp.
Trerice Co.

GAGE TESTERS, Fluid-scale
Crosby Steam Gage Co.
Manning, Maxwell & Moore
Refinery Supply

GAGE TESTERS, Liquid-column
Ideal Lab. Tool
Manning, Maxwell & Moore
Meriam Inst. Co.
Parks Co. Harry S.
Pioneer Instrument
Refinery Supply
Trerice Co.

GAGES (See also object of Measurement and control)

GAGES, Absolute Pressure
Autoflight Inst. Div.
Bailey Meter Co.
Black Mfg. Co.
Bristol Co.
Brown Inst. Co.
Cook Electric
Eclipse-Pioneer Div.
Electro Products Lab.
Foxboro Co.
Fulton Sylphon Co.
General Elec. Co.
Hathaway Inst. Co.
Kollsman Inst. Div.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Moeller Instrument
Pioneer Instrument
Precision Therm.
Scientific Inst. Co.
Skaneateles Mfg. Co.
Statham Labs.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Instrument Co.
United States Gauge
Wallace & Tiernan

GAGES, Air
American Chain & Cable
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Black Mfg. Co.
Bristol Co.
Detroit Air Meter Co.
Eclipse-Pioneer Div.
Electric Auto-Lite
Fischer & Porter
Foxboro Co.
Friez Div.
Fulton Sylphon Co.
Gauthier, Donat A.
Hays Corp.
Lambert Meter Co., Inc.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Merz Engineering
Parks Co., Harry S.
Rochester Mfg. Co.
Seely Inst. Co.
Sheffield Corp.
Statham Labs.
Tagliabue Mfg. Co.
Trerice Co.
Uehling Inst. Co.
U. S. Gauge
Weksler Thermometer
Witt Gage Co.

GAGES, Adjustable Length
Acme Industrial
Federal Products Corp.
Ford Motor
Merz Engineering
Scherr Co., George
Sheffield Corp.
Size Control Co.
Standard Gage
Swedish Gage
Vinco Corp.
Woodworth Co.

GAGES, Alarm
Ashton Valve Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Bfown Inst. Co.
Ellison Draft Gage Co.
Fischer & Porter
Foxboro Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Parks Co., Harry S.
Petrometer Corp.
Precision Therm. & Inst.
Trerice Co.
U. S. Gauge
Weksler Thermometer
Wheelco Instruments

GAGES, Amplifying
Coats Mach. Tool Co.
Comtor Co.
Federal Prod. Corp.
Merz Engineering
(Cont'd)

GAGES, Amplifying (Cont'd)
Poole Manufacturi
Precision Gage &
Scherr Co., Inc.
Sheffield Corp.
Size Control Div.
Statham Labs.
Swedish Gage

GAGES, Automatic ing
Arma Corporation
Electric Eye Equ
Electric Sorting
Federal Products
Hathaway Instrum
Heyman Co.
Instrument Specialt
Magnetic Gauge
Martin-Hubbard
Merz Engineering
Rowe Radio Resea
Sheffield Corp.
Yankee Precision

GAGES, Bore
Brown & Sharpe
Commercial Researc
Comtor Co.
Federal Prod. Cor
Gauthier, Donat
Merz Engineering
Moore Products
Poole Manufacturi
Pratt & Whitney
Scherr Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Swedish Gage
Yankee Precision

GAGES, Bourdon
American Chain & Cable
Ashton Valve Co.
Bailey Meter Co.
Baldwin Locomotive
Bastian-Blessing Co.
Beacon Gage Co.
Beifield Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Crosby Steam Gage
Dickson Co.
Electric Auto-Lite
Foxboro Co.
Gordon Co., Claud S.
Gotham Inst. Co.
Hays Corp.
Heise Bourdon Tube
Hoke, Inc.
Kollsman Inst. Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Mercoid Corp.
Modern Product Dev.
Pioneer Instrument
Republic Flow Meters
Shallcross Controls
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
United States Gauge
Weksler Thermometer
Welch Scientific
Wheelco Instruments
Witt Gage Co.

GAGES, Caliper (Dial)
Amer. Measuring Insts.
Brown & Sharpe
Comtor Co.
DoAll Co.
Federal Prod. Corp.
Glogau & Co.
Magnetic Gauge Co.
Marshall Co.
Size Control Div.
Starrett Co.
Vinco Corp.
Waltham Dial Gage

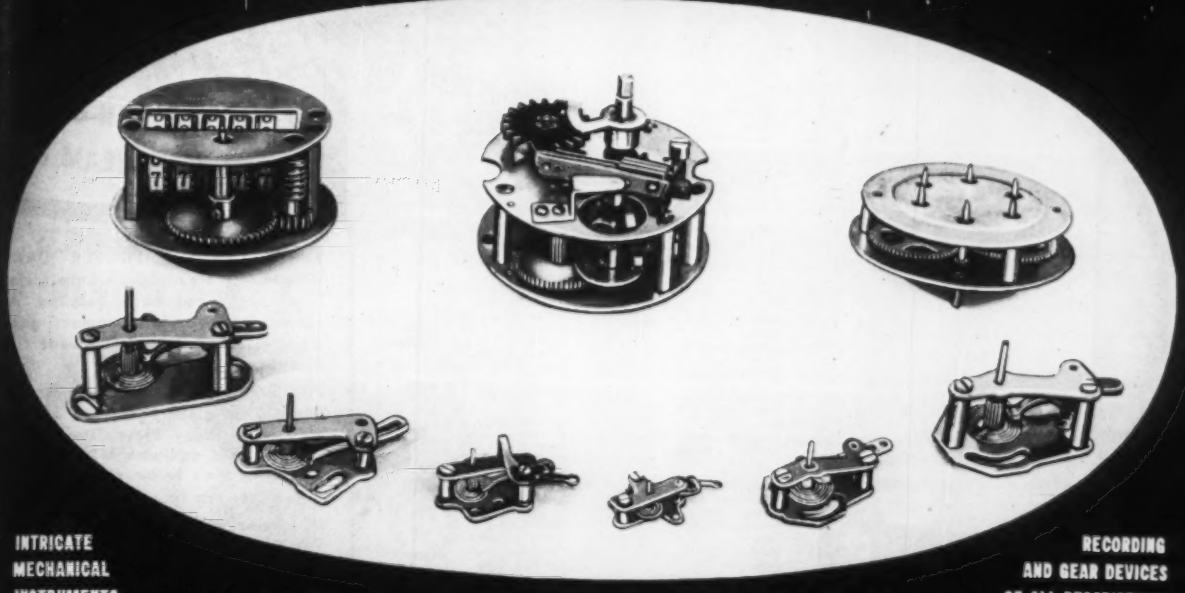
GAGES, Center
Brown Sharpe
Lufkin Rule Co.
Millers Falls Co.
Sie Control Div.
Starrett Co.
Union Tool Co.
Vinco Corp.

GAGES, Coating Thickness
American Inst. Co.

GAGES Comparator
Amer. Measuring Insts.
Ames Co., B. C.
Center Scope Inst.
Coats Mach. Tool Co.
Compar Inst. Co.
Comtor Co.
DoAll Co.
Federal Prod. Co.
Ferner Co.
Ferner Co.
Gauthier, Donat
General Elec. Co.
General Engg. & Model
Hathaway Instrument
Instrument Specialties Co.
Jones & Lamson Machine
Merz Engineering
Metron Instrument
Moore Products
Poole Manufacturing
Pratt & Whitney
Precision Gage & Tool
Scherr Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Surface Checking Gage
Swedish Gage
Vinco Corp.
Waltham Dial Gage
Woodworth Co.
Yankee Precision

PRESSURE GAUGE MOVEMENTS

Straight and Round Reading Registers



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73-77 Norfolk Street Newark (4), N.J.

64 YEARS SERVING THE INDUSTRY

WE MAKE THE HEART OF THE INSTRUMENT

GAGES, Compression
Bacharach Indus. Inst.
Baldwin Locomotive
Dillon & Co.
Marsh Corp.
Olsen Testing Machine
Precision Scientific
Riehle Div.
Statham Labs.
Toledo Scale Co.
United States Gauge
Witt Gage Co.

GAGES, Continuous, Thickness
Commercial Research
Electric Eye Equip.
Federal Products Corp.
Foxboro Co.
Gauthier, Donat A.
Hathaway Instrument
Magnetic Gauge Co.
Merz Engineering
Poole Manufacturing
Pratt & Whitney
Sheffield Corp.
Starrett Co.
Televiso Products
Vinco Corp.
Waltham Dial Gage
Yankee Precision

GAGES, Continuous, Width
Federal roducts CoPrp.
Gauthier, Donat A.
Hathaway Instrument
Magnetic Gauge Co.
Merz Engineering
Sheffield Corp.
Size Control Div.
Vinco Corp.
Yankee Precision

GAGES, Contour see **Gage, Profile**

GAGES, Cylinder
American Gage Co.
Ames Co., B. C.
Brown & Sharpe
Coats Mach. Tool
Comtor Co.
Elgin National Watch
Federal Prod. Corp.
Lufkin Rule Co.
Merz Engineering
Pipe Machinery
Pratt & Whitney
Poole Manufacturing
Richards Machine Tool
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Swedish Gage

GAGES, Dead Weight
American Instrument
Eastern Specialty
Gordon Co., Claud S.
Grove Regulator
Link Engineering
Manning, Maxwell & Moore
Mansfield & Green
Ruska Inst. Corp.

GAGES, Depth, Linear
Amer. Measuring Insts.
Ames Co., B. C.
Brown & Sharpe
Carson Micrometer
DoAll Co.
Federal Products Corp.
General Elec. Co.
Glogau & Co.
Jansson Gage Co.
Lincoln Park Tool & Gage
Lufkin Rule Co.
Merz Engineering
Millers Falls
Park Sales
Petrometer Corp.
Pratt & Whitney
R & M Mfg. Co.
Ryan Tool & Engg.
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Swedish Gage
Union Tool Co.
Vinco Corp.
Waltham Dial Gage

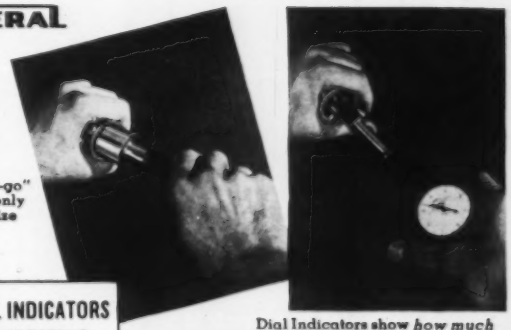
GAGES, Depth, Navigational
Geophysical Inst. Co.
King Engineering Corp.
Negus, T. S. & J. D.
Parks Co., Harry S.
U. S. Gauge

GAGES, Dial, Machinists'
American Meas. Insts.
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Ind.
DoAll Co.
Federal Prod. Corp.
Ferner Co.
Genales, Andrew
General Engg. & Model
Micro Master Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Vinco Corp.
Waltham Dial Gage

GAGES, Differential Pressure
American Meter Co.
Ashton Valve Co.
Autoflight Insts. Div.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Beason Gage Co.
Black Mfg. Co.
Boiler Room Equip.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Crosby Steam Gage
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Ellison Draft Gage Co.
Electro Products Lab.
Foxboro Co.
Frieg & Sons
Fuess, Inc.
Gas Appliance Specialties
Gauthier, Donat A.
General Elec. Co.
Hathaway Inst. Co.
Hays Corp.
Kollsman Inst. Div.
Lambert Meter Co.
Leupold & Stevens
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Co.
Metron Instrument
Modern Product Dev.
Moeller Instrument
Moore Products Co.
Parks Co., Harry S.
Perfex Corp.
Pioneer Instrument
Pitometer Log Corp.
Precision Scientific
Precision Therm.
Preferred Utilities Mfg.
Republic Flow Meters
Ring Balance Inst.
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Statham Labs.
Tagliabue Mfg. Co.
Taylor Inst. Co.
Trimount Instrument
Uehling Instrument Co.
U. S. Gauge
Witt Gage Co.

GAGES, Draft (See **Gages, Differential Pressure**)

FEDERAL



"Go—no-go" shows only if off size

Dial Indicators show *how much*

USE DIAL INDICATORS FOR INSPECTING

ANGLE
CONCENTRICITY
DEPTH
HEIGHT
CURVATURE
LENGTH
INSIDE DIAMETER
LOCATION
THICKNESS
OUTSIDE DIAMETER
SQUARENESS
THREAD
WIDTH
AND COMBINATIONS OF DIMENSIONS

THE BLIND SPOT
in old-fashioned gaging methods

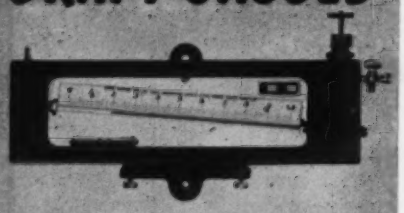
THE conventional "go — no-go" gage serves only to cut down the passing of defective workpieces. The *modern* Dial Indicator method actually cuts inspection and production costs; improves the quality and quantity of production. With Federal Dial Indicators, you instantly *see how much* and *which way* each workpiece varies from its specifications. You know when and where production is tending to become unsatisfactory; you can adjust the machines before this happens.

THE CUSHIONED MOVEMENT — specially designed to withstand repeated shocks — can be had on all but the smaller sizes of Federal Dial Indicators.

Write us for illustrated Bulletin No. 49

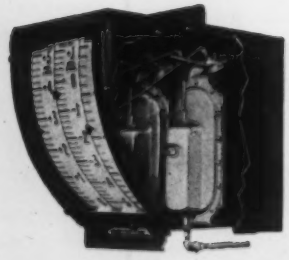
FEDERAL PRODUCTS CORP., 1144 Eddy Street, Providence 1, R. I.

DRAFT GAUGES



● These are extremely serviceable direct reading instruments for measuring low pressures, drafts and differentials—built with inclined tubes to give increased scale length and permit the taking of readings in fractional inches of water. Each instrument individually calibrated to assure extremely accurate operation. Oil or mercury filled tubes. Also two-tube and three-tube models for taking multiple readings with the same gauge. Fully descriptive catalog sent on request.

THE MERIAM INSTRUMENT CO.
10938 MADISON AVENUE
CLEVELAND 2, OHIO
Manometers, Meters, and Gauges for the accurate measurement of Pressures, Vacuums and Flows of Liquids and Gases.



BAILEY MULTI-POINTER GAGES

● Bailey Multi-Pointer Gages are made with any number of pointers and any scale combination from one to twelve. The pointers have 10" motion over plainly marked plastic molded scales so that readings can be taken at a distance of 20 feet. Diaphragm actuated elements enable this gage to withstand over-drafts and over-pressures without injury to the unit or its calibration.

All secondary factors such as draft, pressure, temperature, stoker speed and pulverizer feed can be indicated on one Bailey Multi-Pointer Gage.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

GAGES, Drill Grinding
Brown & Sharpe
Dearborn Gage Co.
Lufkin Rule Co.
Size Control Div.
Starrett Co.

GAGES, Feeler
Acme Industrial
American Meas. Insts.
Barker Tool Die
Brown & Sharpe
Dearborn Gage Co.
Elgin National Watch
Improved Gauge Mfg.
Lufkin Rule Co.
Millers Falls Co.
Size Control Div.
Starrett Co.
Swedish Gage
Union Tool Co.
Van Keuren Co.
Vinco Corp.

GAGES, Flush Pin
Acme Industrial
Allen Gauge & Tool Co.
American Gage Co.
Amer. Measuring Insts.
Barker Tool Die
Dearborn Gage Co.
Elgin National Watch
Federal Products Corp.
Jansson Gage Co.
Lawrence & Hill
Lincoln Park Industries
Lufkin Rule Co.
Merz Engineering
Pipe Machinery
Sheffield Corp.
Size Control Div.
Swedish Gage
Vinco Corp.
Woodworth Co.
West & Dodge Thread
Yankee Precision

GAGES, Gas
Abercrombe Pump Co.
American Meter Co.
Bailey Meter Co.
Bastion-Blessing
Black Mfg. Co.
Bristol Co.
Connelly Co.
Detroit Air Meter
Dickson Co.
Foxboro Co.
Gas Appliance Specialties
General Elec. Co.
Linde Air Products
Lambert Meter Co.
Meriam Co.
Mason-Neilan Regulator
Marsh Corp.
Parks Co., Harry S.
Republic Flow Meters
Rochester Mfg. Co.
Specialty Glass Co.
Statham Labs.
Superior Meter Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Witt Gage Co.

GAGES, Grinding
American Meas. Insts.
Ames Co., B. C.
Barker Tool Die
Brown & Sharpe
Comtor Co.
Dearborn Gage Co.
Elgin National Watch
Federal Prod. Corp.
Lufkin Rule Co.
Master Gauge
Merz Engineering
Moore Products
Sheffield Corp.
Size Control Div.

GAGES, Grinding Finish
Surface Checking Gage

GAGES, Height
Air Instrument Corp.
Allen Gauge & Tool Co.
Amer. Measuring Insts.
Ashton Valve Co.
Barker Tool Die
Brown & Sharpe
DoAll Co.
Federal Products Corp.
Ford Motor Co.
General Engg. & Model
Jansson Gage Co.
Lufkin Rule Co.
Merz Engineering
Ryan Tool & Engg.
Scherr Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Vinco Corp.

GAGES, Hook
Barker Toole Die
Gurley, W. & L. E.
Leupold & Stevens
Lufkin Rule Co.
Scientific Inst. (Calif.)
White Co. Inc.

GAGES, Hydrostatic
(See Gages, Liquid Level, Indicating)

GAGES, Internal Dial
Ames Co., B. C.
Bryant Chucking Grinder
Coats Mach. Tool
Comtor Co.
DoAll Co.
Federal Prod. Corp.
Gen. Engg. & Model Wks.
Merz Engineering
Scherr Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Swedish Gage
Vinco Corp.

GAGES, Limit
Acme Industrial
Amer. Measuring Insts.
Barker Tool Die
Brown & Sharpe
Dearborn Gage Co.
Detroit Tap & Tool
Ford Motor Co.
Fox Munitions
General Elec. Co.
Gen. Engg. & Model Wks.
Greenfield Tap & Die
Jansson Gage Co.
Metron Instrument
Merz Engineering
M-G Gage Corp.
Pipe Machinery
Pratt & Whitney
Sheffield Corp.
Size Control Div.
Standard Gage
Swedish Gage
Van Keuren Co.
Vinco Corp.
West & Dodge
Woodworth Co.
Yankee Precision

GAGES, Liquid Level Indicating
American Meter Co.
Anderson Co.
Ashton Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bastian-Blessing
Belfield Co.
Bin-Dicator Co.
Boston Auto Gage
Bowser & Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Bunnell Co., J. H
Burt Scientific Labs.
B. W. Controller
Canadian Radium
Clapp Instrument
Cochrane Corp.
Control Corp.
Cook Electric
Crosby Steam Gage
Davis Reg. Co.
Defender Automatic Reg.
Dickson Co.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Electric Auto-Lite
Elec. Indicator Corp.
Elec. Tachometer Corp.
Elematic Equip. Co.
Electronic Prod. Co.
Esterline-Angus
Fischer & Porter
Fisher Governor Co.
Foxboro Co.
Frick Co.
General Controls Co.
General Elec. Co.
Gorrell & Gorrell
Gotham Inst. Co.
Gray Instrument
Guardian Electric
Gurley, W. & L. E.
Hammel-Dahl Co.
Hathaway Inst. Co.
Hays Corp.
Infilco, Inc.
Instrument Lab., Inc.
Jerguson Gage Co.
Johnston & Jennings
Kellogg Switchboard
King Engineering
Klingerit, Inc.
Leeds & Northrup Co.
Leupold & Stevens
Liquidometer Co.
Liquid Scale-Gauge
Lufkin Rule Co.
Lumenite Elec. Co.
Magnetrol, Inc.
Magnus Brass Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
McAlear Mfg.
McNeill Engineering
Meriam Co.
Minneapolis-Honeywell
Moore Products
Nathan Mfg. Co.
Natural Gas Equipment
Packard Engineering
Paragon Electric
Parks Co., Harry S.
Penberthy Injector Co.
Petrometer Corp.
Photoswitch, Inc.
Pitometer Log Corp.
Pneumercator Co., Inc.
Positel Mfg. Co.
Precision Therm.
Preferred Utilities Mfg.
Reliance Gauge Column
Republic Flow Meters
Rochester Mfg. Co.
Schutte & Koerting Co.
Simmonds Aerocessories
Simplex Valve & Meter
Smith Meter Co.
Statham Labs.
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Trimount Instrument
U C Indicator Sales
Uehling Instrument Co.
U. S. Gauge
Wallace & Tiernan
Weksler Thermometer
Warrick Co.

(Cont'd)

MAINTAINING PROPER DRAFT is relatively a simple job once a Hays Draft Gage has been installed. Accurate measurements supplant guesswork, resulting in more efficient combustion.

HAYS ORIGINATED and perfected the dry or diaphragm type of draft gage and today Hays Draft Gages are standard equipment in thousands of the nation's boiler rooms.

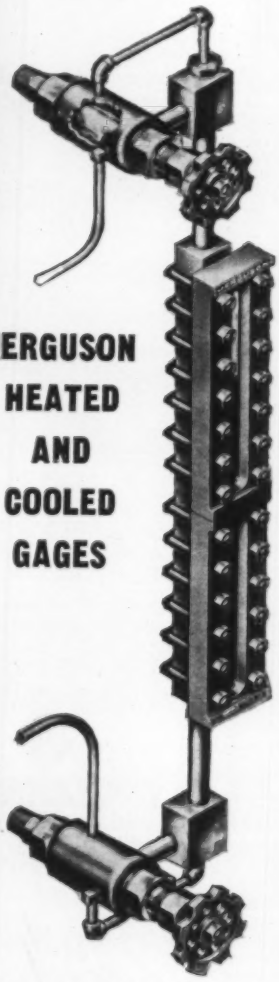
HAYS DRAFT GAGES are offered in a wide variety of types from the V-type, illustrated above, to recording gage. Send for our catalog today. Write to 925 Eighth Avenue, Michigan City, Indiana.

THE HAYS CORPORATION
MICHIGAN CITY, INDIANA, U.S.A.

GAUGES FOR RECORDING AND CONTROLLING PRESSURE, DRAFT, VACUUM, ABSOLUTE PRESSURE, LIQUID LEVEL

Bristol Recording Gauges are offered in a wide variety of models for pole, wall and panel mounting and for portable service. Included are models for ranges from full vacuum to 12,000 lbs. sq. in., moisture-, water-, fume- and dust-proof cases—in single, double, or three-pen instruments. Write for Bulletin G600. The Bristol Co., 113 Bristol Road, Waterbury 91, Conn.

ENGINEERS PROCESS CONTROL FOR BETTER PRODUCTS AND PROFITS



JERGUSON HEATED AND COOLED GAGES

READ LIQUID LEVEL ACCURATELY Under All Conditions With JERGUSON Heated And Cooled Gages

USE Jerguson Heated Gages for accuracy if you are dealing with high viscosity liquids that flow sluggishly. For highly volatile liquids which tend to boil, use Jerguson Cooled Gages with circulating cooling medium. Two models, Double Chamber or Internal Tube, in a large selection of sizes. (Internal Tube model, reflex type, illustrated.)

Write for Engineering Data Unit No. 17

JERGUSON
GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.
Representatives in Major Cities
Phone Listed Under JERGUSON

GAGES, Liquid Level Indicating (Cont'd)
Westinghouse Elec. & Mfg.
Wheelco Inst. Co.
Williams Gauge Co.
Watt Gage Co.
Yarnall-Waring Co.

GAGES, Liquid Level, Recording (See Gages, Liquid Level, Indicating)

GAGES, Loss of Head
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Builders-Providence
Foxboro Co.
Infilco, Inc.
International Filter Co.
Parks Co., Harry S.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
Uehling Inst. Co.

GAGES, Mercury
Amthor Testing Mach.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Builders-Providence
Central Scientific
Connelly Co.
Defender Automatic Reg.
Distillation Products
Dwyer Mfg. Co.
Electronic Products
Gas Appliance Specialties
General Elec. Co.
Hays Corp.
Heise Bourdon Tube
Ideal Lab. Tool
King Engineering
Machlett & Son
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument
Parks Co., Harry S.
Precision Therm.
Refinery Supply Co.
Scientific Glass Apparatus
Simplex Valve & Meter
Specialty Glass Co.
Stoetling Co., C. H.
Tagliabue Mfg. Co.
Taylor Insti. Cos.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
Wallace Scientific
Westinghouse Elec

GAGES, Micrometer
American Meter Co.
Ames Co., B. C.
Amthor Testing Mach.
Axelson Mfg.
Brown & Sharpe
Central Scientific Co.
Coats Mach. Tool Co.
Elgin National Watch
Gaertner Scientific Corp.
Gauthier, Donat A.
Instrument Specialties Co.
Lufkin Rule Co.
Miller Falls Co.
Paulson & Co.
Precision Therm. & Inst.
Richards Mach. Tool
Scherr Co.
Size Control Div.
Slocomb Co.
Starrett Co.
Swedish Gage
Van Keuren Co.
Vinco Corp.
Wilmotte, Inc.
Zeiss, Inc., Carl

GAGES, Oil (See Gages, Liquid Level)

GAGES, Optical
Acme Industrial
Amer. Measuring Insts.
Bausch & Lomb
Chicago Dial Ind. Co.
Clark & Sons
DoAll Co.
Fecker, Inc.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Jones & Lamson Machine
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Ruska & Co.
Scherr Co.
Sheffield Corp.
Vinco Corp.
Zeiss, Inc., Carl

GAGES, Paint Film
American Inst. Co.
Carson Micrometer
General Elec. Co.
Hathaway Inst. Co.
Instrument Specialties Co.
Metron Instrument
Munsell Color Co.

GAGES, Paper Thickness (See Gages, Thickness)

GAGES, Piston Ring
Amer. Measuring Insts.
Brown & Sharpe
Elgin National Watch
Federal Products Corp.
Link Engineering
Littelfuse Inc.
Lufkin Rule
Merz Engineering
Sheffield Corp.
Size Control Div.
Swedish Gage
Wilkening Mfg. Co.

LIQUIDOMETER remote reading gauges automatically indicate or record liquid levels. No pumps, valves or auxiliary units required to read them. Balanced hydraulic transmission system ingeniously compensates for temperature variations on communicating tubing. Accuracy unaffected by variation in specific gravity. Approved by Underwriters Laboratories and similar bodies for gauging hazardous liquids. Models are available for remote signals, automatic control of pumps, etc. DIRECT READING models available where remote reading is not required.

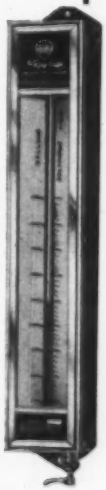
Write for details on LIQUIDOMETER instruments.

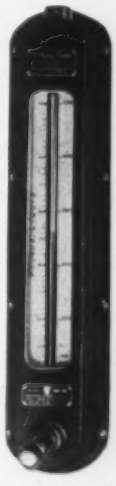
THE LIQUIDOMETER CORP.
36-27 SKILLMAN AVE., LONG ISLAND CITY, N.Y.

Liquid Measurement

with the

King-Gage



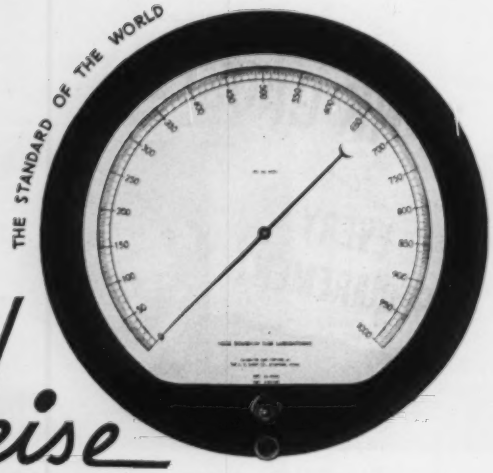


A simple hydrostatic balance—no floats, gears, diaphragms, or moving parts—rugged construction — accurate measurements of laboratory standard for commercial use. An accurate instrument for mixing and blending various liquids.

The King-Gage is widely used in paint, chemical and food industry in place of expensive weigh tanks. On storage tanks, it gives an accurate check on receipts, inventory and consumption. Widely used on ships of the U. S. Navy and Maritime Commission as well as on locomotives to show oil and water in storage and service tanks. Write our Engineering Department for information on any of your liquid measuring problems. Twenty years of experience. Engineering representatives in 15 of the large cities throughout the country are all at your service.

(Approved by Underwriters' Laboratories)

KING ENGINEERING CORPORATION
Ann Arbor, Michigan



Heise

STANDARD FOR TESTING OTHER GAUGES

Recognized as the standard for testing pressure readings with dead weight accuracy, Heise Extreme Precision Gauges provide the quickest reliable way of testing: (1) new ordinary gauges, (2) inspector's gauges, (3) for faster results where dead weight testers have been used.

RANGE FROM 0-15 TO 0-16,000 P.S.I.
8½" DIAL.....151.80
12" DIAL.....172.80 & 165.60
16" DIAL.....201.20 & 194.00

HEISE BOURDON TUBE LABORATORIES
BROOK ROAD NEWTOWN, CONNECTICUT
IN COLLABORATION WITH THE A. H. EMERY COMPANY

Available in sizes even smaller than a postage stamp, SR-4 strain gages have revolutionized the art of stress analysis, thereby greatly expanding its field of usefulness in making structures stronger by making them *lighter* Easily applied, low unit cost. Ask for Bulletin 179

The Baldwin Locomotive Works, Philadelphia 42, Pa., U.S.A. Offices: Philadelphia, New York, Boston, Birmingham, Houston, St. Louis, Chicago, Cleveland, Detroit, San Francisco, Seattle, Washington, Pittsburgh.

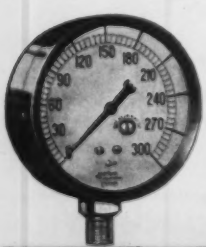
BALDWIN
TESTING EQUIPMENT

MARSH
Pressure Gauges

Mastergauge—

Marsh quality, stamina and accuracy is found in its highest development in the "Mastergauge". Accuracy is guaranteed within ½ of 1% of reading. Advanced monel and stainless steel movement and rugged bourdon tube assure *lasting* accuracy under all conditions. Try the Mastergauge where others have failed. There is one for every service.

"Recalibrator"—describes Marsh method of correcting a gauge that has been knocked out of adjustment. Quickest and best means ever devised. Available in all Marsh Gauges.



Standard Gauge—

A moderately priced gauge which represents remarkable value. Wide range of types—pressure; compound; vacuum.

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2063 Southport Avenue, Chicago, Illinois

GAGES, Pitch Diameter
Acme Industrial
Brown & Sharpe
Bryan Chucking Grinder
Detroit Tap & Tool
DoAll Co.
Federal Prod. Corp.
Greenfield Tap & Die
Lufkin Rule Co.
Merz Engineering
Pipe Machinery
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Size Control Div.
Starrett Co.
Union Tool Co.
Van Keuren Co.
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Yankee Precision

GAGES, Plug
Acme Industrial
American Gauge Co.
Amer. Mearuring Insts.
Barker Tool Die
Brown & Sharpe
Corning Glass Works
Dearborn Gage Co.
Detroit Tap & Tool
DoAll Co.
Elgin National Watch
Ford Motor Co.
Greenfield Tap & Die
Lawrence & Hill
Lincoln Park Industries
Merz Engineering
Pipe Machinery
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Swedish Gage
United Precision Prod.
Vinco Corp.
West & Dodge Thr. Gage
Woodworth Co.
Cankee Precision

GAGES, Pneumatic Tank
Bacharach Industrial
Barton Inst. Co.
Foxboro Co.
Gauthier, Donat A.
Marsh Corp.
Mason-Neilan Regulator
Pneumercator Co.
Rochester Co.
Uehling Inst. Co.

GAGES, Precision Measuring
Acme Industrial
Ames Co., B. C.
Amer. Measuring Inst.
Arma Corporation
Brown & Sharpe
Bryant Chucking Grinder
Carson Micrometer
Comtor Co.
Dearborn Gage Co.
Elgin National Watch
Federal Prod. Corp.
Ferner Co.
Ford Motor Co.
Gauthier, Donat A.
General Elec. Co.
Jansson Gage Co.
Lufkin Rule Co.
Magnetic Gauge Co.
Martin-Hubbard Corp.
Merz Engineering
Metron Instrument
Moore Products
Phoenix Prec. Inst.
Physicists Research
Poole Manufacturing
Pratt & Whitney
Rieker Instrument Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Swedish Gage
Thwing-Albert Inst. Co.
United Precision Prod.
Van Keuren Co.
Vinco Corp.
Webber Gage Co.
Wilmotte, Inc.
Woodworth Co.
Carl Zeiss, Inc.

GAGES, Pressure, Indicating
Abercrombe Pump Co.
American Chain & Cable
American Meter Co.
Anderson Co.
Ashton Valve Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Baird Meter Co.
Baird Associates
Baldwin Locomotive
Bastian-Blessing
Beacon Gage Co.
Belfield Co.
Black Mfg. Co.
Boekel & Co.
Bristol Co.
(Cont'd)

GAGES, Pressure, Indicating (Cont'd)
Brown Inst. Co.
Bryant Chucking Grinder
Brush Development Co.
Builders-Providence
Central Scientific Co.
Clark Blast Meter
Clarkstan Corp.
Consol. Ashcroft Hancock
Consolidated Engg.
Continental Elec. Co.
Crosby Steam Gage
Dayton-Rogers Mfg. Co.
Defender Automatic Reg.
Dickson Co.
Dillon & Co.
Distillation Products
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Electric Apto-Lite
Electro Products Labs
Electronic Products Co.
Elematic Equip. Corp.
Esterline-Angus Co.
Fisher Scientific Co.
Foxboro Co.
Fredericks, George
Friez & Sons
Fulton Syphon Co.
Gas Appliance Specialties
General Elec. Co.
General Physical Lab.
Gordon Co., Claud S.
Gotham Inst.
Green, Henry J.
Hathaway Inst. Co.
Hays Corp.
Heise Bourdon Tube
H & H Thermostats
Kollsman Inst. Div.
Kurman Electric
Logansport Machine
Lonergan Co.
Magnetic Gauge Co.
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp.
Marshalltown Mfg.
Mason-Neilan Regulator
Mercoid Corp.
Meriam Co.
Metron Instrument
Modern Product Dev.
Moeller Instrument Co.
Moore Products
National Research
Nurnberg Thermometer
Parks Co., Harry S.
Perfex Corp.
Physicists Research
Plumb Co., Inc.
(Cont'd)

GAGES, Pressure, Indicating (Cont'd)
Positel Mfg. Co.
Precision Gage & Tool
Precision Therm.
Preferred Utilities Mfg.
Ranco Inc.
RCA Div.
Refinery Supply Co.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Glass App.
Scientific Inst. Co.
Seely Inst. Co., Inc.
Skaneateles Mfg. Co.
Statham Labs.
Stoelting Co., C. H.
Stokes Machine Co.
Superior Meter Co.
Sylvania Elec. Prod.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Inst. Co.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
U. S. Gauge
Wagner & Son, Carl H.
Wallace & Tiernan (Low Pressure)
Wasch Labs.
Weksler Thermometer
Welch Scientific
Wheelco Instruments
Wilgus Manufacturing
Witt Gage Co.

GAGES, Pressure—Recording (See Gages, Pressure, Indicating)

GAGES, Pressure Temperature (See Gages, Pressure Indicating)

GAGES, Pressure, Tire
U. S. Gage
Witt Gage Co.

GAGES, Pressure & Vacuum (See Gages, Pressure Indicating)

GAGES, Profile
Acme Industrial
American Gage Co.
Amer. Measuring Insts.
Barker Tool Die
Brush Development
Dearborn Gage Co.
Foxboro Co.
General Elec. Co.
(Cont'd

GAGES, Profile (Cont'd)
Jansson Gage Co.
Lincoln Park Industries
Martin-Hubbard Corp.
Merz Engineering
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Sheffield Corp.
Size Control Div.
Stockton Profile Gauge
Swedish Gage Co.
Woodworth Co.
Vinco Corp.
Yankee Precision

GAGES, Radius
Acme Industrial
American Meas. Insts.
Barker Tool Die
Brown & Sharpe
Dearborn Gage Co.
Ford Motor Co.
Lufkin Rule Co.
Size Control Div.
Starrett Co.
Swedish Gage Co.
Vinco Corp.
Wilmotte, Inc.
Woodworth Co.

GAGES, Rain (See Rain Gages

GAGES, Rifle Bore
Baldwin Southwark
Federal Products Corp.
Gauthier, Donat Co.
Hathaway Inst. Co.
Moore Products
Poole Mfg. Engrs.
Pratt & Whitney
Sheffield Corp.
Size Control Div.
Vinco Corp.

GAGES, Ring
Acme Industrial
Allen Gauge & Tool Co.
American Gage Co.
Amer. Measuring Insts.
Barker Tool Die
Brown & Sharpe
Corning Glass Works
Dearborn Gage Co.
Detroit Tap & Tool
Elgin National Watch
Gauthier, Donat A.
Greenfield Tap & Die
Johnson Gage Co.
Lawrence & Hill
Lincoln Park Industries
Merz Engineering
Pipe Machinery
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Swedish Gage Co.
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Worley Jewel Co.
Yankee recision
Zeiss, Inc., Carl

GAGES, Screw Thread
Acme Industrial
Allen Gauge & Tool Co.
Brown & Sharpe
Clark, Jr. Pneumatic Tool
Detroit Tap & Tool
Federal Prod. Corp.
Greenfield Tap & Die
Jansson Gage Co.
Johnson Gage Co.
Lincoln Park Industries
Lufkin Rule Co.
Merz Engineering
Millers Falls Co.
Pipe Machinery
Pratt & Whitney
Reed Small Tool Works
Sheffield Corp.
Size Control Div.
Starrett Co.
Union Tool Co.
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Zeiss, Inc., Carl

GAGES, Sliding
Acme Industrial
Amer. Measuring Insts.
Lufkin Rule Co.
Pratt & Witney
Size Control Div.
Van Keuren Co.

GAGES, Snap
Acme Industrial
Allen Gauge & Tool Co.
American Gage Co.
Amer. Measuring Insts.
Barker Tool Die
Brown & Sharpe
Dearborn Gage Co.
Detroit Tap & Tool
Federal Products Corp.
Gauthier, Donat A.
Gen. Engg. & Model Wks.
Greenfield Tap & Die
Jansson Gage Co.
Johnson Gage Co.
Lawrence & Hill
Merz Engineering
M-G Gage Corp.
Pipe Machinery
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Scherr Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Swedish Gage
Vinco Corp.

GAGES, Spline
Acme Industrial
American Meas. Insts.
Brown & Sharpe
Merz Engineering
Pipe Machinery
Pratt & Whitney
Precision Gage & Tool
Sheffield Corp.
Size Control Div.
Standard Gage
Vinco Corp.

GAGES, Star
Gauthier, Donat A.
Moore Products
Pratt & Whitney
Yankee Precision

GAGES, Strain
Acme Industrial
American Inst. Co.
Bailey Meter Co.
Baldwin Locomotive
Eitzen Co.
Electronic Products Co.
Federal Products Corp.
Gauthier, Donat A.
General Elec. Co.
Hathaway Inst. Co.
Hays Corp.
Heiland Research
Metzger & Son
Miller Corp., Wm.
Olsen Testing Machine
Pratt & Whitney
Riehle Testing Mach.
Size Control Div.
Starrett Co.
Statham Labs.
Waugh Laboratories

GAGES, Surface
Acme Industriel
American Meas. Insts.
Ames Co., B. C.
Brown & Sharpe
Brush Development
Comtor Co.
Federal Prod. Corp.
Genales, Andrew
Jansson Gage Co.
Lufkin Rule Co.
Millers Falls Co.
Optron Laboratory
Physicists Research
Precision Scientific
Size Control Div.
Standard Gage
Starrett Co.
Swedish Gage
Vinco Corp.
Yankee Precision
Zeiss, Inc., Carl

GAGES, Surface Finish Checking
Physicists Research
Surface Checking Gage

GAGES, Taper
Acme Industrial
American Gage Co.
Barker Tool Die
Brown & Sharpe
Dearborn Gage Co.
Elgin National Watch
Federal Prod. Corp.
Gauthier, Donat A.
Lincoln Park Tool
Merz Engineering
Micro Master Co.
Poole Mfg. Co.
Precision Gage & Tool
Pratt & Whitney
R & M Mfg. Co.
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Swedish Gage
United Precision Prod.
Vinco Corp.
Woodworth Co.
Yankee Precision

GAGES, Telescoping
Brown & Sharpe
Lufkin Rule Co.
Starrett Co.

GAGES, Thickness
American Inst. Co.
Ames Co., B. C.
Amthor Testing Inst. Co.
Barker Tool Die
Branson Instruments
Brown & Sharpe
Canadian Radium
Carson Micrometer
Commercial Research
Dearborn Gage Co.
Federal Prod. Corp.
Ford Motor Co.
Foxboro Co.
Gauthier, Donat A.
Glogau & Co.
Gen. Engg. & Model Wks
General Elec. Co.
Hathaway Inst. Co.
Ill. Testing Labs.
Instrument Specialties Co.
Lawrence & Hill
Lufkin Rule Co.
Magnetic Gauge Co.
Marshall Co.
Merz Engineering
Metzger & Son
Millers Falls Co.
Moore Products
Poole Manufacturing
Pipe Machinery
Pratt & Whitney
Precision Gage & Tool
Precision Scientific Co.
Precision Therm. & Inst.
Randall Frank E.
R & M Mfg. Co.
Sheffield Corp.
Size Control Div.
Speidel & Co.

(Cont'd)

HELICOID SCORES AGAIN!

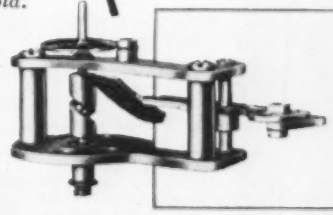
• The new ACALOY case is a high-compression molded aluminum alloy. Treated by a patented process to prevent corrosion. Durable baked-on finish. Withstands 1200 hours salt spray test.

Weather-proof. Neoprene sealing gasket. 18-8 stainless steel snap ring. Greater strength — less weight. It's another Helicoid exclusive.

With back flange for wall mounting, or without flange for stem mounting. Safety blow-out discs optional.

Specify Helicoid gages in the new ACALOY case. They will reduce your maintenance expense. . . . the Helicoid movement, with no gear teeth to wear out, lasts many times longer.

Send for the new catalog that tells the complete story of Helicoid.



Only Helicoid pressure gages have the Helicoid movement.

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE
Bridgeport 2, Connecticut

TRADE MARK

for

COMBUSTIBLE GAS

or

OXYGEN

..INDICATION..
..RECORDING..
..CONTROL..

J-W

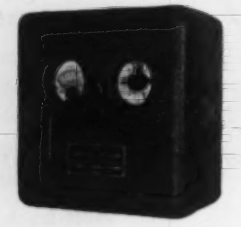
INSTRUMENTS

for Exploration

PORTABLES

for "Watchman" Control

ALARMS



for Testing

LABORATORY

for Process Control, Recording,— (illustrated—Mud Analyzer for Oil Well Drilling).

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for

ROUTINE SAFETY
OPERATING ECONOMY
ENGINEERING GUIDANCE

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Instrumentation News

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Gas Analyzers and Gas Alarms

DAVIS MICRO-GAS ANALYZER
For Carbon Bisulphide, Chlorinated Hydrocarbons, Hydrogen Sulphide, Sulphur Dioxide, Nitrous Fumes.

IN THE TOXIC RANGE

•

DAVIS OXYGEN ANALYZER

•

The New
DAVIS FLUE GAS ANALYZER

The Improved
DAVIS THERMAL CONDUCTIVITY GAS ANALYZERS FOR
One Gas in Air
One Gas in another
One Gas (gas purity and gas proportioning)

•

The Improved
DAVIS COMBUSTIBLE GAS ALARM SYSTEM

We invite your inquiry for more details

1918

INSTRUMENT DEECO DIVISION

DAVIS EMERGENCY EQUIPMENT CO., INC.
80 Halleck Street, Newark 4, N. J.

GAGES, Thickness (Cont'd)
Standard Gage
Starrett Co.
Suter Alfred
Swedish Gage
Thwing-Albert Inst. Co.
Union Tool Co.
Van Keuren Co.
Vinco Corp.
Waltham Dial Gage
Westinghouse Elec.
Woodworth Co.
Yankee Precision

GAGES, Thickness, Magnetic
American Inst. Co.
Commercial Research
Electric Eye Equip.
General Elec. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Magnetic Gauge Co.
Metron Instrument
Waugh Labs.

GAGES, Tide
American Inst. Co.
Balluf Mfg. Co.
Foxboro Co.
Leupold & Stevens
Parks Co. Harry S.
Petrometer Corp.
Uehling Instrument Co.

GAGES, Torque
Airdraulics Engineering
General Elec. Co.
Hagan Corp.
Hathaway Inst. Co.
Manning, Maxwell, Moore
Martin Decker Corp.
Metron Instrument
Riehle Div.
Statham Labs.
Sturtevant Co.
Toledo Scale Co.

GAGES, Vacuum (See Gages, Pressure)

GAGES, Venturi (See Flow Meters, Venturi)

GAGES, Water Level (See GAGES, Liquid Level)

GAGES, Wind
American Inst. Co.
Detroit Air Meter
Friez & Sons
Fuess, Inc.
Green, Henry J.
Hastings Inst. Co.
Illinois Testing Labs.
Kenyon Inst. Co.
Rieker Inst. Co.
Taylor Inst. Cos.
Thomas Co., Arthur H.

GAGES, Wire Measuring
Amer. Measuring Insts.
Ames Co., B. C.
Brown & Sharpe
Federal Prod. Corp.
Foxboro Co.
General Elec. Co.
Greenfield Tap & Die
Hathaway Inst. Co.
Instr. Specialties Co.
Magnetic Gauge Co.
Merz Engineering
Moore Products
Pratt & Whitney
Sheffield Corp.
Size Control Div.
Starrett Co.

GAGING FIXTURES
Acme Industrial
Amer. Measuring Insts.
Allen Gauge & Tool Co.
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Vinco Corp.
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Sensitive Research Inst.
Tagliabue Div.
Waugh Labs.
Welch Mfg. Co.
Weston Elec. Inst.
Wheelco Inst. Co.

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Central Scientific Co.
Chicago Apparatus Co.
Dale Instruments
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Leeds & Northrup Co.
Rawson Electrical Inst.
Sensitive Research Inst.
Welch Scientific
Westinghouse Elec.
Wheelco Inst. Co.

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Brown Inst. Co.
Brush Development Co.
Cambridge Inst. Co.
Central Scientific Co.
Century Geophysical
Chicago Apparatus Co.
Consolidated Engg.
Dale Instruments
De Jur-Amsco
Edison Elec. Controls
Electronic Development
General Elec. Co.
G-M Labs.
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Heiland Research
Hickok Elect. Inst. Co.
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Marion Electric Inst.
M B Instruments
Meters, Inc.
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Pfaltz & Bauer, Inc.
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Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Elec. Co.
Taco West Corp.
Tagliabue Mfg. Co.
Thwing-Albert Inst.
Triplett Electrical Inst.
Waugh Labs.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.
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Magnetostriction Devices

GALVANOMETERS, Piezoelectric
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Waugh Labs.

GALVANOMETERS, Reflecting
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Brush Development
Century Geophysical
Coleman Instrument
Consolidated Engg.
General Elec. Co.
G-M Laboratories
Hathaway Inst. Co.
Heiland Research
Leeds & Northrup
Pfaltz & Bauer
Rawson Electrical Inst.
Rubicon Co.
Ruska & Co.
Thwing-Albert Inst. Co.
Waugh Labs.

GALVANOMCTERS, Vacuum-tube
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Electro Products Lab.
Engineering Labs., Inc.
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Harvey Radio Labs.
Hathaway Instrument Co.
Heiland Research
Measurements Corp.
National Technical Labs.
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Tagliabue Div.
Varo Mfg. Co.

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Hathaway Inst. Co.
Leeds & Northrup

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Welch Scientific

GAS ANALYZERS, Air
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Cambridge Inst. Co.
Central Scientific Co.
Cook Electric
Davis Emergency Equip.
Fish-Schurman Co.
Fisher Scientific Co.
Friez Div.
General Elec. Co.
Hays Corp.
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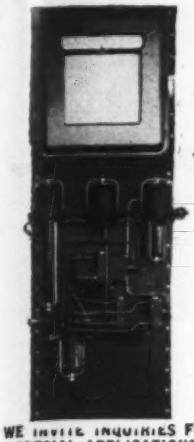

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Hebler Co.
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Permutit Co.
Sargent & Co.
Tagliabue Mfg. Co.

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Bailey Meter Co.
Baird Associates
Brown Inst. Co.
Burrell Tech. Supply
Cambridge Inst. Co.
Central Scientific Co.
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Gordon Co., Claud S.
Gow-Mac Instrument
Hays Corp.
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Lantz-Phelps Corp.
Leeds & Northrup Co.
Machlett & Son
Permutit Co.
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Preferred Utilities Mfg.
Refinery Supply Co.
Republic Flow Meters
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
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Baird Associates
Burrell Technical Supply
Cambridge Inst. Co.
Central Scientific
Chicago Apparatus Co.
Eclipse Aviation
Fish-Schurman Co.
Fisher Scientific
General Elec. Co.
HaysCorp.
Laboratory Equip. Co.
Leeds & Northrup Co.
Machlett & Son
Mine Safety Appliances
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Div.
Will Corporation

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Consolidated Engg.
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General Elec. Co.
Hebler Co.
Industrial Insts. Inc.
National Tech. Labs.
Precision Scientific
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Baird Associates
Burrell Tech. Sup.
Consolidated Eng.
Davis Emergency Equip.
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
Hebler Co.
Industrial Insts. Inc.
Johnson-Williams, Ltd.
National Tech. Labs.
Precision Scientific

GAS ANALYZERS, Hydrogen
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Burrell Technical Supply
Chicago Apparatus Co.
Davis Emergency Equip.
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
Hays Corp.
Hebler Co.
Johnson-Williams, Ltd.
Leeds & Northrup

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Burrell Technical Supply
Cambridge Inst. Co.
Connelly Co.
Consolidated Engg.
Davis Emergency Equip.
Fisher Scientific
Hebler Co.
Industrial Inst. Incs.
Johnson-Williams, Ltd.
Mine Safety Appliance
Rubicon Co.
Sargent & Co.
Scientific Glass Apparatus

GAS ANALYZERS, Nitric Oxide
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Cambridge Inst. Co.
Davis Emergency Equip.
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
Hays Corp.
Rubicon Co.
Sargent & Co.

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Bailey Meter Co.
Burrell Technical Supply
Central Scientific Co.
Chicago Apparatus Co.
Defender Automatic Reg.
Dwyer Mfg. Co.
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Hays Corp.
Howe & French, Inc.
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Precision Therm.
Sargent & Co.
Scientific Glass App.
Specialty Glass Co.
Thomas Co., Arthur H.

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Bailey Meter Co.
Burrell Technical Supply
Chicago Apparatus Co.
Cambridge Inst. Co.
Davis Emergency Equip.
Eclipse Aviation
Hays Corp.
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Johnson-Williams, Ltd.
Leeds & Northrup
Mine Safety Appliances
National Tech. Labs.
Precision Scientific
Sargent & Co.
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Central Scientific Co.
Davis Emergency Equip.
Fisher Scientific
Hays Corp.
Hebler Co.
Laboratory Equip. Co.
Leeds & Northrup
Mine Safety App. Co.
Precision Scientific
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Burrell Tech. Sup.
Cambridge Inst. Co.
Davis Emergency Equip.
Engelhard, Chas.
Fish-Schurman Co.
Hays Corp.
Hebler Co.
Laboratory Equip. Co.
Leeds & Northrup Co.
Precision Scientific
Sargent & Co.
Scientific Glass App.
Tagliabue Div.
Uehling Instrument Co.

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Refinery Supply Co.

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McFarlin Co.
Municipal Inst.
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Norwalk Valve Co.
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Water Leak Detector Co.
Western Instrument Co.

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GAS METERS, INFERENTIAL—Flow Nozzle (See Flowmeters, Orifice and Nozzle)

GAS METERS, INFERENTIAL — Orifice (See Flowmeters, Orifice and Nozzle)

GAS METERS, INFERENTIAL — Pitot-tube (See Flowmeters, Pitot-tube)

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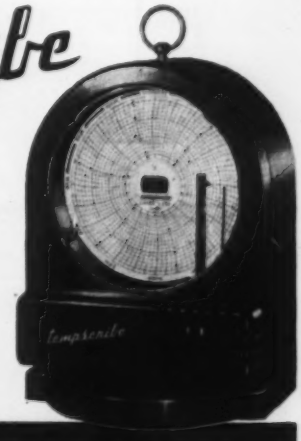

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−10°	to	+50° F.	24 hours
30°	to	60° F.	24 hours
40°	to	100° F.	7 days
40°	to	100° F.	24 hours
60°	to	90° F.	24 hours
70°	to	130° F.	8 hours
100°	to	160° F.	4 hours
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5°	to	40° C.	24 hours

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Gates & Co.
Raytheon Mfg.
Sylvania Elec. Prod.

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Flett Lab.
Fredericks, George
Friez & Sons
General Electric
General Physical Lab.
Hanovia Chem. & Mfg.

GAS & VAPOR DISCHARGE TUBES, Hydrogen
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Ballantine Labs.
Flett Lab.
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Hanovia Chem. & Mfg.
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Flett Lab.
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Machlett & Son
Mico Instrument
Pfaltz & Bauer
Raytheon Mfg.

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Fredericks, George
Gates & Co.
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General Physical Lab.
Jarrell-Ash Co.
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GAS & VAPOR DISCHARGE TUBES, Nitrogen
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Fredericks, George
General Physical Lab.

GAS & VAPOR DISCHARGE TUBES, Sodium
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Flett Lab.
Fredericks, George
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Houston Technical
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Martin-Hubbard Corp.
Metron Instrument
Mico Instrument Co.
Potter Instrument
Radiation Counter Labs.
Ruska Inst. Corp.
Sensitive Research Inst.
Televiso Co.
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Waugh Labs.

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Century Geophysical
Heiland Research Corp.
National Co.
Potter Instrument
Ruska & Co.

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GLARE METERS (See Gloss Meters)

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GLASS TUBING, Precision Bore See Precision—bore Glass Tubing)

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Fish-Schurman Co.
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GLASSWARE, LABORATORY (See Apparatus, Laboratory, Glass)

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Brownell, H. Russell
Central Scientific Co.
Dearborn Scientific
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GLOSS METERS (Cont'd)
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Pfatz & Bauer, Inc.
Photovolt Corp.
Sensitive Research Inst.
Suter, Alfred
Zeiss, Inc., Carl

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American Optical
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Hayes Scientific Appl.
Jarrell-Ash Co.
RCA Div.
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GOVERNORS (See also object of measurement and control)

GOVERNORS, Air (See Regulators, Automatic, Air)

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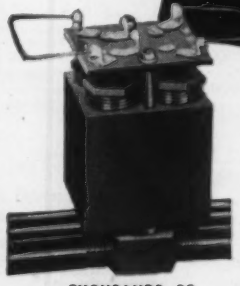

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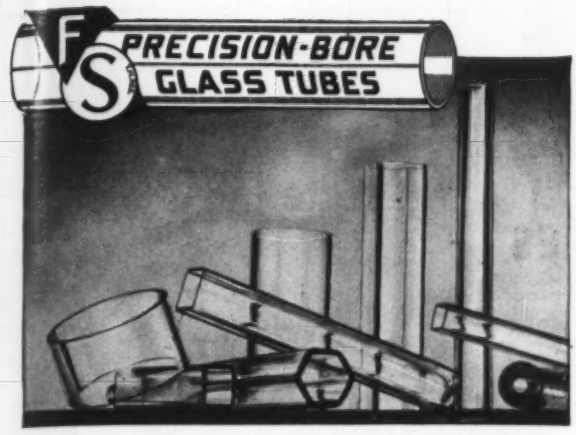

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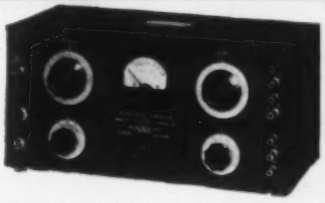

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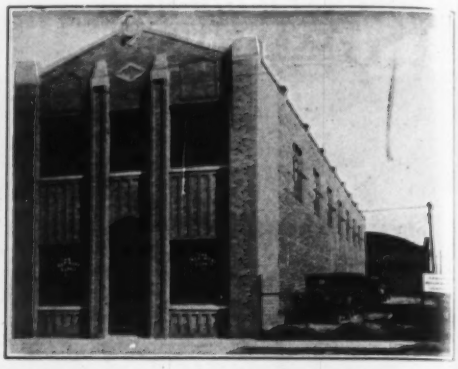

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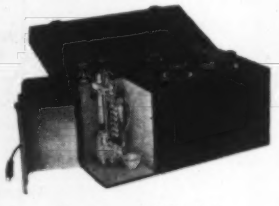

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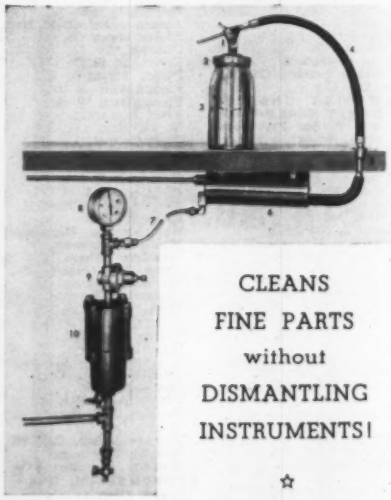

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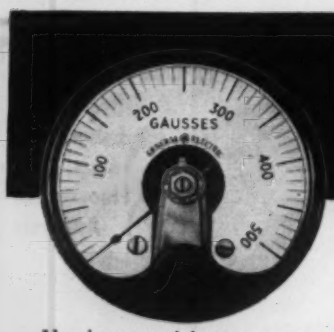

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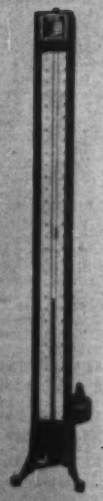

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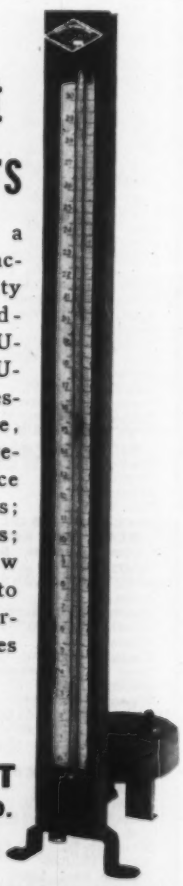

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Sparling, R. W.
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METERS, Decibel (See Sound Level Meters)

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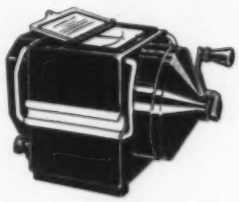
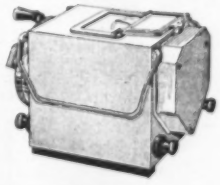


For Insulation Resistance. "Megger" Insulation Testers—Handdriven, Motordriven, "Meg," "Bridge-Meg," "Super-Meg" and Midget Types. *Catalog 21P6-I*



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For Conductor Resistance. "Ducter" Low Resistance Ohmmeters—down to .000001 ohm. *Bulletin 24-25-I*

"Megger" Ohmmeters—up to 1000 megohms. *Bulletin 1540-I*

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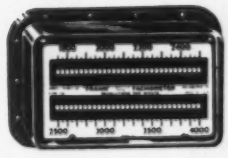

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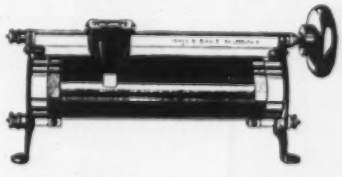

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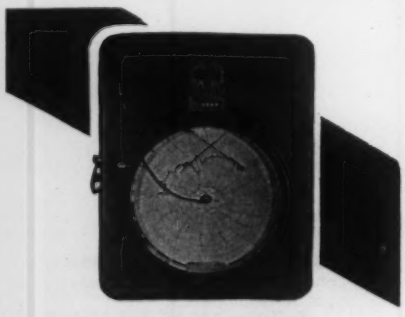

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Associated Research
Automatic Elec. Sales
Burlington Inst. Co.
Electric Indicator Co.
Esterline-Angus Co.
General Elec. Co.
HD Elec. Co.
Landis & Gyr. Inc.
Sangamo Electric Co.
Triplett Elec. Inst.
Westinghouse Elec.

METERS, Demand, Gas
American Meter Co.
Bailey Meter Co.
Bendix Marine Products
Lambert Meter Co.
Mason-Nei'an Regulator
Superior Meter Co.

METERS, Demand Limiting, Automatic
American Meter Co.
Annis Co.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr. Inc.
Mason-Neilan Regulator
Westinghouse Elec. & Mfg.

METERS, Distortion
General Radio Co.
Hewlett-Packard
RCA Div.

METERS, Earth Current
Associated Research
Geophysical Inst. Co.
Heiland Research
Rawson Electrical Inst.
Shallcross Mfg. Co.
Westinghouse Elec.

METERS, Electronic
Atomic Instrument
Bailey Meter Co.
Ballantine Labs.
Barber Labs.
Boonton Radio Corp.
Brown Inst. Co.
Cambridge Inst. Co.
Chicago Indust. Inst.
Clarke Inst. Corp.
Clippard Inst. Lab.
Clough-Brengle Co.
Electric Eye Equip.
Electronic Development
Electronic Dev. Lab.
Electro Products Lab.
Espey Mfg.
Furst Electronic
General Elec. Co.
General Radio Co.
Hathaway Instrument
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Instrument Electronics
Kollsman Inst. Div.
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Precision Apparatus Co.
Radio City Products
RCA Div.
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Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Waterman Products
Welch Scientific
Weston Elec. Inst. Co.
Wheelco Insts. Co.
Wilmotte, Inc.

METERS, Flow (See Flowmeters)

METERS, Fluorescence
Coleman Electric
Pfaltz & Bauer
Photovolt Corp.

METERS, Footage (See Counters, Footage)

METERS, Foot-candle (See Foot-candle Meters)

METERS, Frequency (see Frequency Meters)

METERS, Gas (See Gas Meters)

METERS, Gas, Dry Test
American Meter Co.
Hagan Corp.
Lambert Meter Co.
Republic Flow Meters
Rockwell Mfg.
Superior Meter Co.
Tagliabue Div.

METERS, Gas, Integrating
American Meter Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Lambert Meter Co.
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Superior Meter Co.
Taylor Inst. Cos.

METERS, Gas, Wet Test
American Meter Co.
Lambert Meter Co.
Precision Scientific
Superior Meter Co.
Tagliabue Div.
Taylor Inst. Cos.

METERS, Gas, Station
American Meter Co.
Bowser & Co.

METERS, Gasoline (See Meters, Liquid)

METERS, High Pressure & High Pressure Distribution
Buffalo Meter
Foxboro Co.
Hagan Corp.
Hobbs Corp.
Penn Ind. Inst. Corp.
Republic Flow Meters
Rockwell Mfg.
Simplex Valve & Meter

METERS, Hydrogen Ion (See Hydrogen Ion Determination Instruments)

METERS, Impedance
National Tech. Labs.
Sperry Gyroscope Co.

METERS, LIGHT (See Foot-candle Meters, Illumination Indicators and Recorders, Light Meters, etc.)

METERS, Liquid, Volumetric Types, Nutating Piston or Disk
Askania Regulator Co.
Badger Meter Co.
Brodie Co.
Buffalo Meter Co.
Hays Corp.
National Meter Co.
Neptune Meter Co.
Rockwell Mfg.
Worthington Gamon

METERS, Liquid, Volumetric Types, Oscillating Piston
Badger Meter Co.
Brodie Co., Inc.
National Meter Co.
Neptune Meter Co.
Rockwell Mfg.
Worthington-Gamon Met.

METERS, Liquid, Volumetric Types, Propeller
Badger Meter Mfg. Co.
Builders-Providence
Henszey Co.
Neptune Meter Co.
Rockwell Mfg.
Sparling, R. W.

METERS, Liquid, Volumetric Types, Reciprocating Piston
Askania Regulator Co.
Bowser & Co., Inc.
Brodie Co.
Rockwell Mfg.
Ruska & Co., Inc.
Worthington Gamon

METERS, Liquid, Volumetric, Rotary Piston
Askania Regulator Co.
Badger Meter Co.
Bowser & Co., Inc.
Brodie Co.
Neptune Meter Co.
Revere Co.
Rockwell Mfg.
Smith Meter Co.

METERS, Liquid, Volumetric, Special for Extremely Low Flow
Askania Regulator Co.
Bowser & Co., Inc.
Brooks Rotameter
Commercial Research
Fischer & Porter
Fluid Meters, Inc.
Gauthier, Donat A.
Hays Corp.
National Meter Co.
Schutte & Koerting

METERS, Liquid, Weighing
Commercial Research
Richardson Scale Co.

METERS, Mileage
Avion Instrument
Eclipse-Pioneer Div.
Gauthier, Donat A.
Jaeger Watch Co.
Ohmer Register
Sangamo Electric Co.
U. S. Taximeter
Veeder-Root, Inc.

METERS, Oil (See Meters, Liquid)

METERS, Orifice (See Flowmeters, Orifice)

METERS, Oxygen (See 1—Gas Analyzer; 2—Gas Meters)

METERS, Pitot Tube (See Flowmeters, Pitot Tube)

METERS, Positive Displacement (See Gas Meters, Positive and Liquid Meters, Volumetric)

METERS, Prepayment
American Meter Co.
Landis & Gyr. Inc.
Sangamo Electric Co.

METERS, Proportional
American Meter Co.
Bristol Co.
Fischer & Porter
Foxboro Co.
Mason-Neilan Regulator
National Meter Co.
Proportioneers, Inc.
Republic Flow Meters
Sensitive Research Inst.
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Size Control Co.

MICROMETERS, Dial
Ames Co., B. C.
Amthor Test. Mach.
Coats Mach. Tool Co.
Exact Weight Scale
Federal Prod. Corp.
Ferner Co.
Gen. Engg. & Model Wks.
Glogau & Co.
Instrument Specialties
Marshall Co.
Micro Master Co.
Park Sales
Scherr Co., Inc.
Size Control Co.
Starrett Co.
Waltham Dial Gage Co.

MICROMETERS, Electronic
Carson Micrometer
Electric Eye Equip.
Poole Mfg. Engrs.
Hathaway Inst. Co.
Photoswitch, Inc.
Poole Mfg. Engrs.
Sherron Metallic

MICROMETERS, External
Brown & Sharpe
Carson Micrometer
Elgin National Watch
Lufkin Rule
Marshall Co.
Maveg Machine Sales
Millers Falls
Park Sales
Poole Mfg. Engrs.
Reed Small Tool Works
Richards Mach. Tool
Scherr Co., Inc.
Size Control Div.
Slocomb Co., J. T.
Starrett Co.
Swedish Gage

MICROMETERS, Filar Eyepiece
Bausch & Lomb
Fecker, Inc.
Gaertner Scientific Corp.

MICROMETER, Flying
Magnetic Gauge Co.

MICROMETERS, Internal
Brown & Sharpe
Coats Mach. Tool Co.
Lufkin Rule Co.
Maveg Machine Sales
Micro Products Co.
(Cont'd)

MICROMETERS, Internal (Cont'd)
Millers Falls Co.
Poole Manufacturing
Reed Small Tool Works
Richards Machine Tool
Scherr Co., Inc.
Slocomb Co., J. T.
Starrett Co.
Swedish Gage
Zeiss, Inc., Carl

MICROMETERS, Optical
American Optical
Bausch & Lomb Optical
Fecker, Inc.
Fish-Schurman Co.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Keuffel & Esser Co.
Leitz, Inc.
Mogey & Sons
Palos Optical Co.
Scherr Co., Inc.
Unertl Optical Co.
Zeiss Inc., Carl

MICROMETERS, Pedestal
Bartelt Engg. Co.

MICROMETERS, Radio
Hastings Inst. Co.
Panoramic Radio Co.
Sensitive Research Inst.

MICROPHONES
Amperite Co.
Automatic Elec. Sales
Brush Development
Eby Inc., Hugh
Electro-Voice Mfg.
Globe Phone Mfg. Co.
Kellogg Switchboard
Leich Electric
Rauland Corp.
RCA Div.
Shure Bros.
Western Electric

MICROPROJECTOR
American Meas. Insts.
Bausch & Lomb Optical
Ferner Co.
Jones & Lamson Mach.
Leitz, Inc.
Pfaltz & Bauer
Scherr Co., Inc.
Wilder, Inc.

MICROSCOPE ACCESSORY INSTRUMENTS
American Optical
Bausch & Lomb Optical
Burton Mfg. Co.
Ferner Co.
Gaertner Scientific Corp.
Leitz, Inc.
Microchemical Service
Zeiss, Inc., Carl

METERS, Reactive Component
Boonton Radio Corp.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
RCA Manufacturing
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.

METERS, Rotary Displacement
Askania Regulator Co.
Bowser & Co.
Brodie Co.
Neptune Meter Co.
Smith Meter

METERS, Sewage
American Meter Co.
Bailey Meter Co.
Bristol Co.
Builders-Providence
Hagan Corp.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Republic Flow Meters
Rockwell Mfg.
Simplex Valve & Meter
Taylor Inst. Cos.

METERS, Shunt
Builders-Providence
Burlington Inst. Co.
Columbia Elec. Mfg.
Daven Co.
Electronic Development
Fischer & Porter
Instrument Resistors
Radio City Products
Rawson Electrical Inst.
Reiner Electronics
Shallcross Mfg.
Wheelco Inst. Co.
Westinghouse Elec.

METERS, Sight Flow
Bowser & Co., Inc., S. F.
Commercial Research
Everson Mfg. Co.
Fischer & Porter Co.
Henszey Co.
Schutte & Koerting
Selas Co.

METERS, Station
American Meter Co.
Bristol Co.

METERS, Steam (See Flowmeters, Steam)

METERS, Time
Aero Instrument Co.
Berkeley Scientific
Betts & Betts
Bristol Co.
Cramer Co., Inc.
Cyclotron Specialties
Elec. Tachometer Corp.
General Elec. Co.
(Cont'd)

METERS, Time (Cont'd)
Haydon Co.
Industrial Timer Corp.
Jaeger Watch Co.
J-B-T Instruments
Luers, J. Milton
Marion Electrical Inst.
National Instrument Co.
Paragon Electric Co.
Rawson Electral Inst.
Rowe Radio Res. Lab.
Standard Elec. Time
Thompson Clock Co.
Waltham Wahch
Warren Telechron Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

METERS, Ultraviolet Radiation
General Elec. Co.
Pfaltz & Bauer
Photovolt Corp.
Westinghouse Elec.

METERS, Venturi (See Flowmeters, Venturi)

METERS, V-notch (See Flowmeters, Weir)

METERS, Volumetric, Positive Displacement (See Gas Meters, Positive; see Meters, Liquid, Volumetric)

METERS, Water (See Liquid Meters, Volumetric; also Flowmeters, Liquid)

METERS, Watt-Hour
Associated Research
Duncan Electric
General Elec. Co.
Landis & Gyr, Inc.
Sangamo Electric Co.
Sticht Co.
Westinghouse Elec.

METERS, Weir (See Flowmeters, Weir)

MICROAMMETERS (See Ammeters, Microammeters)

MICRODENSITOMETERS see Densitometers

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Assembly Products
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Gen. Elec. Lamp Dept.
Leitz Inc.
Microchemical Service
Pfaltz & Bauer, Inc.
Precision Scientific
Zeiss, Inc., Carl

MICROSCOPES, Ballistic Comparison
Bausch & Lomb Optical
Leitz, Inc.
Zeiss, Inc.

MICROSCOPES, Binocular
American Optical
Bausch & Lomb Optical
Boehmke Optical Co.
Federal Mfg. & Eng.
Ferner Co.
Leitz, Inc.
Polarizing Instrument
Scherr Co., Inc.
Suter, Alfred
Zeiss, Inc., Carl

MICROSCOPES Biological (See Microscopes, Binocular)

MICROSCOPES, Brinell
Bausch & Lomb Optical
Detroit Testing Mach.
Ferner Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
Gordon Co.
Leitz, Inc.
Olsen Testing Machine
Pittsburgh Inst. & Mach.
Riehle Division

MICROSCOPES, Dark Field
American Optical
Bausch & Lomb Optical
Ferner Co.
Polarizing Instrument

MICROSCOPES, Finish Comparison
American Optical
Bausch & Lomb Optical
Compar Inst. Co.
Fecker, J. W.
Fuess, Inc.
Gaertner Scientific Corp.
Leitz, Inc.
Pike & Co., E. W.
Scherr Co., Inc.
Zeiss, Inc., Carl

MICROSCOPES, Inspection (See Microscopes, Finish Comparison)

MICROSCOPES, Measuring
American Optical
Bausch & Lomb Optical
Central Scientific Co.
Dome Precision
Fecker, J. W.
Ferner Co.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Leitz, Inc.
Maveg Machine Sales
Mico Instrument Co.
Palos Optical Co.
Scherr Co., Inc.
Stebar Co.
Triplex Machine Tool
Zeiss, Inc., Carl

MICROSCOPES, Metallographic
Abrams Instrument
American Optical
Bausch & Lomb Optical
Ferner Co.
Leitz, Inc.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Scherr Co., Inc.
Zeiss, Inc., Carl

MICROSCOPES, Petrographical
American Optical
Bausch & Lomb Optical
Ferner Co.
Leitz, Inc.
Zeiss, Inc., Carl

MICROSCOPES, Thread Contour (See Microscopes, Finish Comparison)

MICROSCOPES, Toolmaker's
American Meas. Insts.
Bausch & Lomb Optical
Dome Precisiin
Ferner Co.
Gaertner Scientific Corp.
Goerz Amer. Optical
Leitz, Inc.
Maveg Machine Sales
Mico Instrument Co.
Pfaltz & Bauer
Scherr Co., Inc.
Zeiss, Inc., Carl
Zenith Optical Co.

MICROSCOPES, Wire Gaging
Bausch & Lomb Optical
Ferner Co.
Zeiss, Inc., Carl

MICROTOMES
American Optical
Baldwin Locomotive
Bausch & Lomb Optical
Cambridge Inst. Co.
Central Scientific Co.
Ferner Co.
International Equip. Co.
Leitz, Inc.
Mico Instrument Co.
Thomas Co., Arthur H.

MICROVOLTMETERS (See Voltmeters, Micro)

MILEAGE METERS (See Meters, Mileage)

MILK TESTERS (See Testers, Milk)

MILLIAMMETERS (See Ammeters, Milliammeters)

MILLIOHMMETERS (See Ohmmeters, Milliohmmeters)

MILLIVOLTMETERS (See Voltmeters, Millivoltmeters)

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Fish-Schurman Co.
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Glendale Optical
Gurley, W. & L. E.
Hathaway Inst. Co.
Henson Co., Fred C.
Keuffel & Esser Co.
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Laboratory Specialties
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Palos Optical Co.
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Pioneer Instrument
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Robinson Optical Co.
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Delmhorst, William
Dietert Co.
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Hart Moisture Gages
H & H Thermostats
Measurements Corp.
Moisture Register Co.
Precision Scientific
Seedburo Equip. Co.
Serdex, Inc.
Sherron Metallic
Tagliabue Div.

MOISTURE TESTING APPARATUS (See Testers & Testing Machines, Moisture)

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MONOCHROMATIC LIGHT SOURCES (See Light Sources, Monochromatic)

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Leitz, Inc.
National Tech. Labs.
Rudolph & Sons
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Brush Development Co.
Builders-Providence
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Foxboro Co.
Martin-Hubbard Corp.
Mason-Neilan Reg. Co.
Photoswitch, Inc.
RCA Manufacturing
Republic Flow Meters
Waugh Labs.

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Automatic Elec. Sales
Bristol Co.
Brush Development Co.
Builders-Providence
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(Cont'd)

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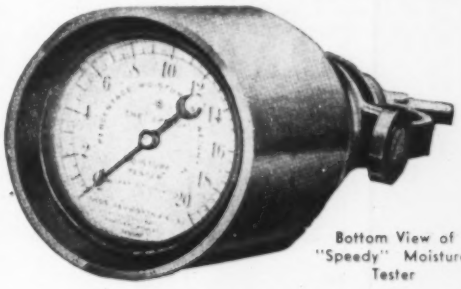

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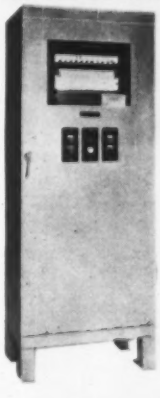

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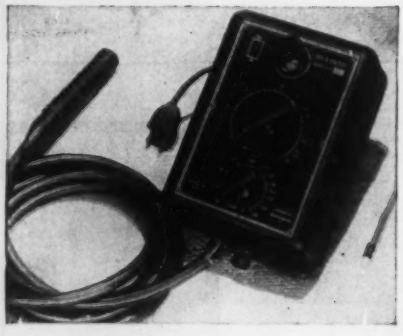

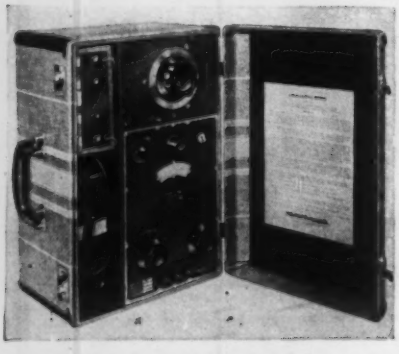

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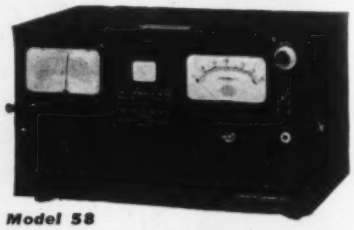

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Frequency Range: 15 to 150 mc. Push-button switching for rapid, accurate measurement of noise levels or field strength.

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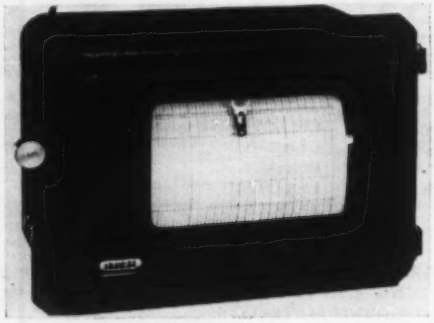

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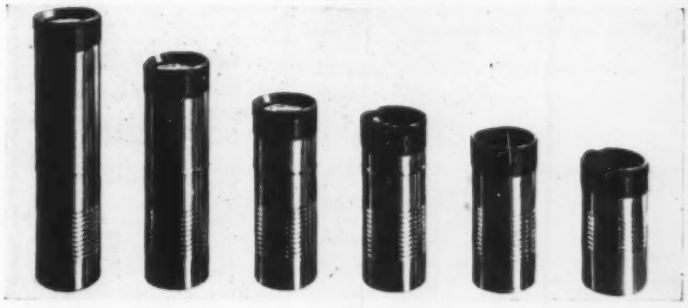

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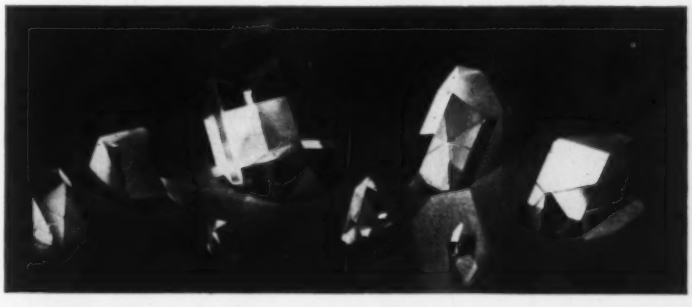

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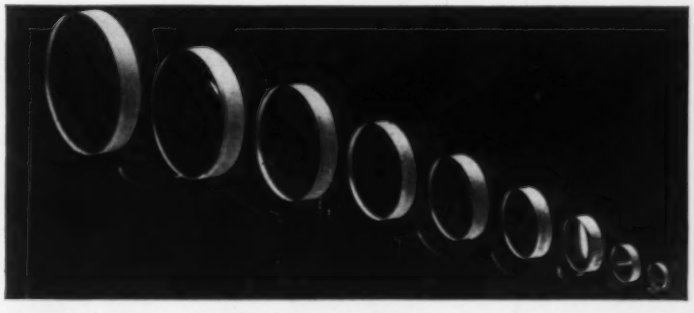

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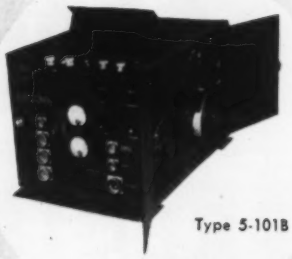
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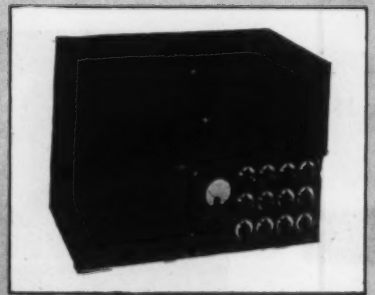
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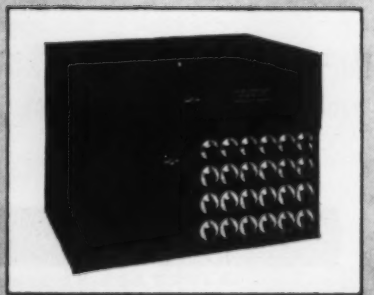
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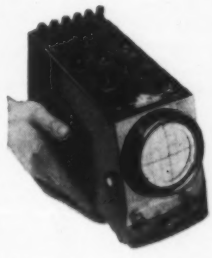

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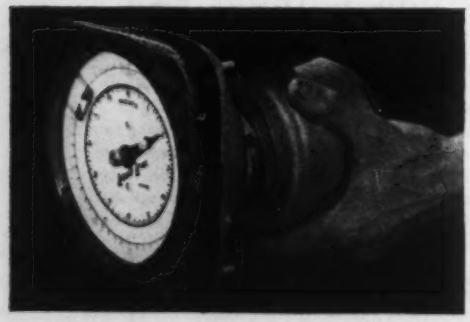

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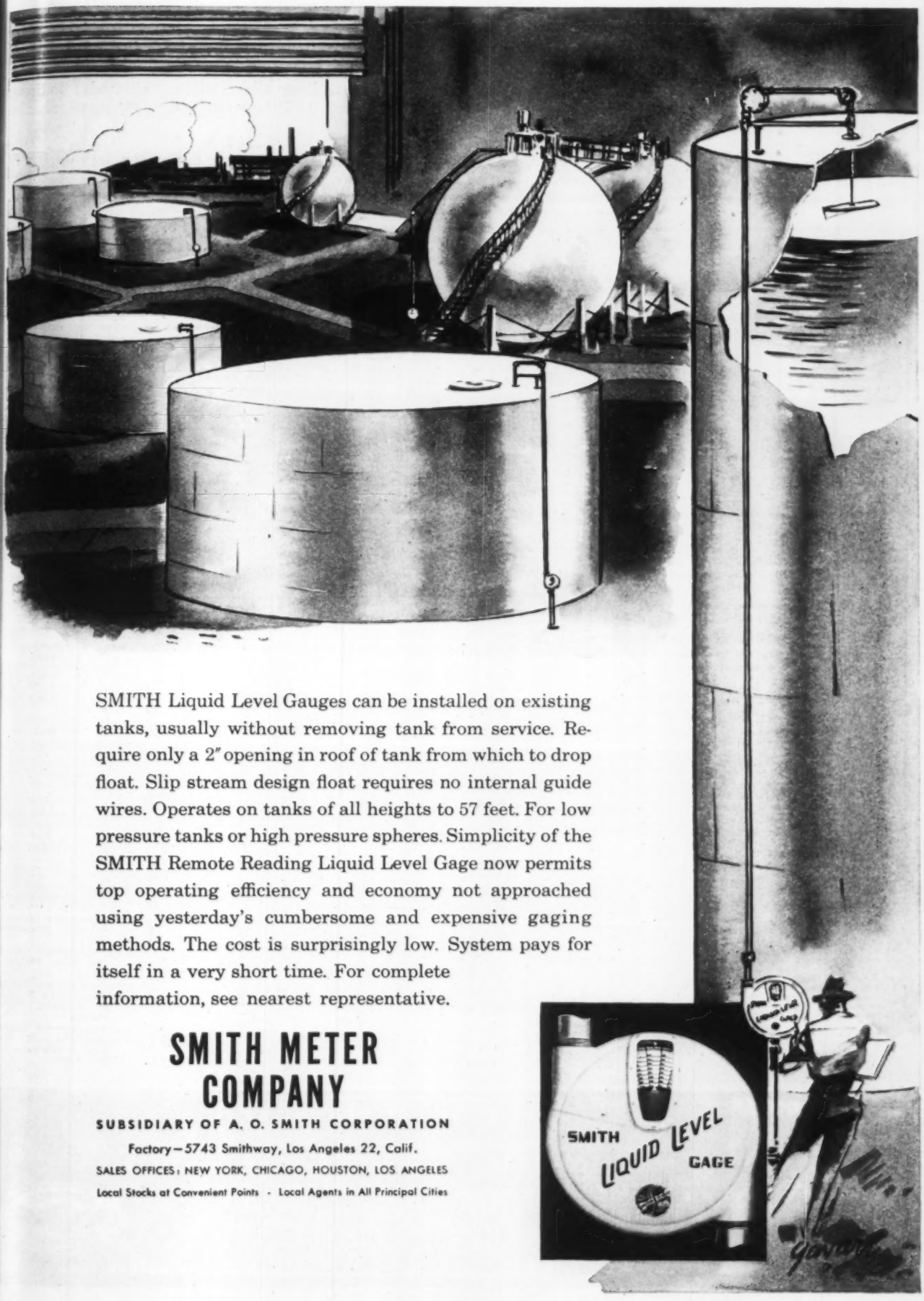

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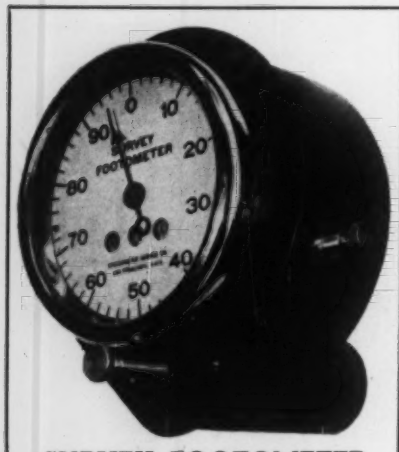

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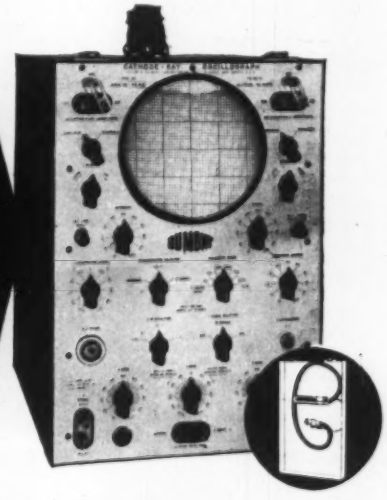

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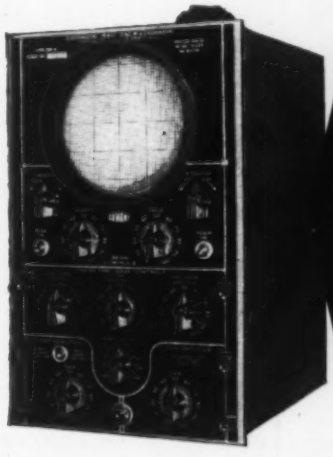

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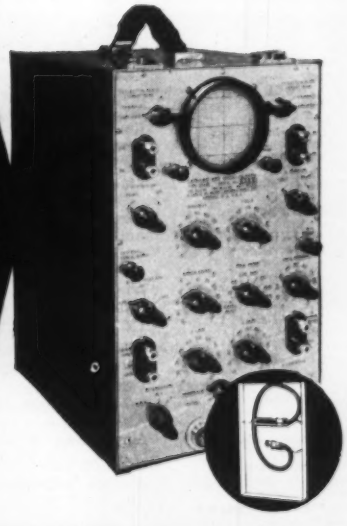

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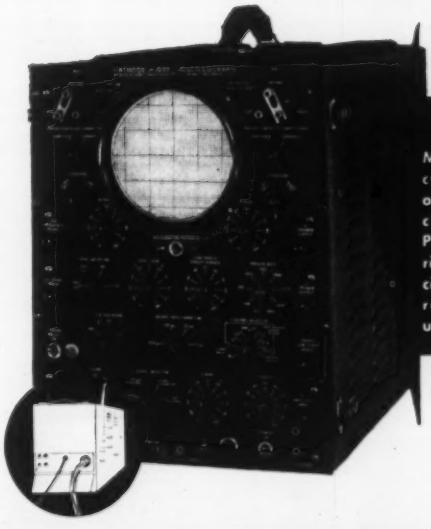

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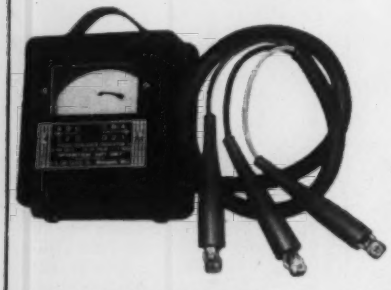

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PHOTO-MICROGRAPHIC EQUIPMENT (See Microscopes, Metallographic)

PHYSICAL TESTING MACHINES (See Testers and Testing Machines)

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PIPETTES, Mechanical (Equal Discharge)
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PISTOL BARREL OPTICAL TESTERS (See Tester, Pistol Barrel Optical)

PITOT - PITOTSTATIC TUBES, Special Aircraft Engine Testing
Eclipse-Pioneer Div.
Refinery Supply
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PITOT TUBES (see Flowmeters, Pitot Tube)

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Roberison, 3rd., J. L.

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POLARISCOPE TUBES (See Tubes, Polariscope)

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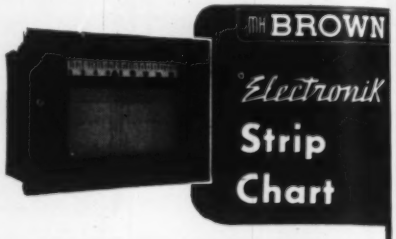
Fuess, Inc., R.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Pfaltz & Bauer, Inc.
Polarizing Instrument
Precision Scientific
Rudolph & Sons
Welch Mfg. Co.



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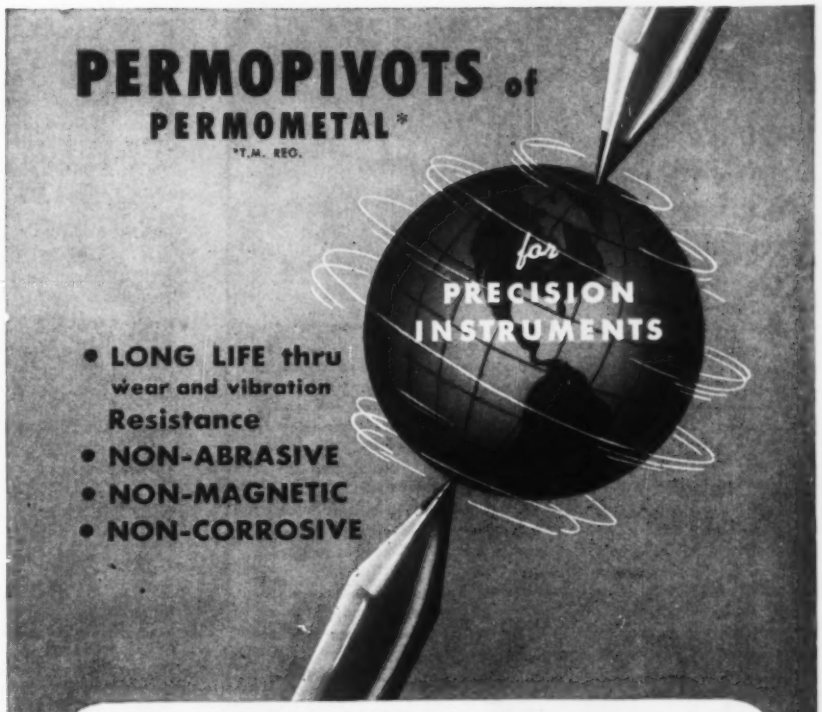

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Van Dyke Instruments
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Weston Elec. Inst. Corp.

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Tagliabue Div.
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Wheelco Insts. Co.
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Cambridge Inst. Co.
Dickson Co.
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Foxboro Co.
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Geophysical Inst. Co.
Gordon Co., Claud S.
Gray Instrument
Hellige, Inc.
J-B-T Insts., Inc.
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Lewis Engg. Co.
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Thwing-Albert Inst. Co.
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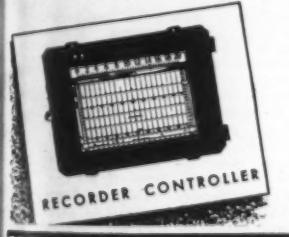

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Builders-Prov[illegible]ce
Cambridge In[illegible] Co.
Cash Co.
Commercial R[illegible]arch
Cook Electric
Crosby Steam [illegible]ge Co.
Dickson Co.
Esterline-Ang[illegible]o.
Foxboro Co.
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Hathaway Inst[illegible] Co.
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Hydraulic Pre[illegible] Co.
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Statham Labs.
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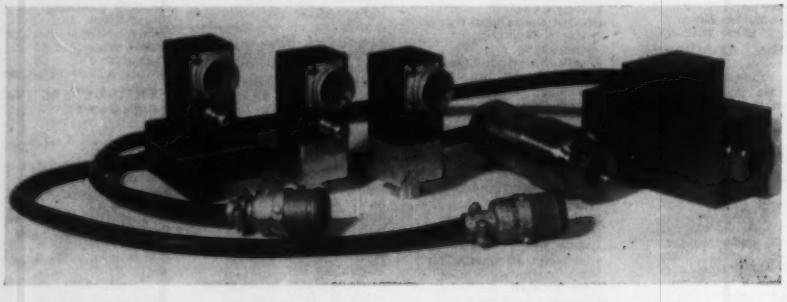
Statham Pressure Transmitters



Remote indication or recording of pressure can be accomplished simply and accurately with Statham Pressure Transmitters.

Their electrical output is sufficient for direct operation of many types of panel microammeters, recording galvanometers, recording potentiometers, or cathode ray oscillographs. A simple power supply, such as dry cells, is sufficient, although any stable source of DC or AC capable of supplying 0.04 A. at low voltage (24 V. or less, depending on the particular instrument) may be used. Our transmitters are ideally suited to use with carrier systems.

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POTENTIOMETER

The Brown ElectroniK "Continuous Balance" Potentiometer employs a compact electronic detecting and balancing unit instead of a galvanometer. The ElectroniK provides greater accuracy, sensitivity and speed of response, as well as continuous non-cyclic action.

Supplied as a thermocouple pyrometer, radiation pyrometer, resistance thermometer, spectrophotometer, millivoltmeter, tachometer, pH meter, etc.

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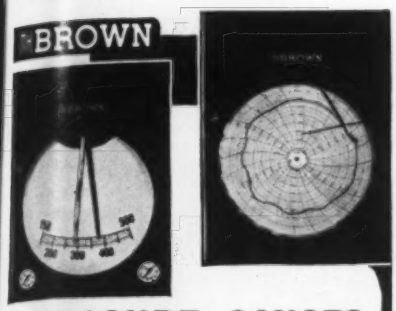
Send for catalogs No. 15-4 and No. 15-11. Also, see Brown ElectroniK Strip Chart Potentiometer in this section. THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

Electronik



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Kollsman Inst. Div.
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Taylor Instrument Cos.
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Waugh Labs.

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Electro Products Lab.
Foxboro Co.
General Elec. Co.
Hathaway Instrument
Rowe Radio Res.
Rubicon Co.
Shallcross Controls
Statham Labs.
Trimount Inst. Co.
Waugh Labs.

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Bristol Co.
Brown Inst. Co.
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Mason-Neilan Regulator
Republic Flow Meters
Shallcross Controls
Taylor Inst. Cos.
Uehling Inst. Co.

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Crystal Research Labs.
Massa Labs.
RCA Manufacturing
Waugh Labs.

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Variable-reluctance pressure transmitters of small size and high output—suitable for absolute or differential pressure measurements, either static or dynamic.

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For measurement of: static and dynamic pressure, acceleration and velocity, vibration, stress and strain, torque, linear and angular position, shock, impact and force.

Trimount Equipment includes carrier systems, pressure gauges, torque meters, angular accelerometers and other devices for research and product design. Used in conjunction with standard indicating and recording oscillographs. Complete information on request.

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Differential Pressure
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Has
RUPTURE-PROOF BELLOWS UNIT

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BULLETIN 181-1 TODAY

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3500 UNION PACIFIC AVE. LOS ANGELES 23, CALIF.

PRESSURE INDICATORS, Single-tube, liquid column (Cont'd)
Manning, Maxwell & Moore
Meriam Co.
Parks Co., Harry S.
Pioneer Instrument
Precision Therm
Uehling Instrument Co.

PRESSURE INDICATORS, Spring-loaded piston
Bacharach Indus. Inst.
Commercial Research
Mansfield & Green

PRESSURE INDICATORS, U-tube
American Meter Co.
Amthor Test. Mach.
Bacharach Indus. Inst.
Bailey Meter Co.
Connelly Iron Sponge
Detroit Air Meter Co.
Dwyer Mfg. Co.
Electronics Products Co.
Friez & Sons
Gas App. Specialties
Gotham Inst. Co.
Ideal Lab. Tool
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument Co.
Parks Co., Harry S.
Precision Therm.
Refinery Supply Co.
Ruska Inst. Corp.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Trimount Inst. o.
Uehling Instrument Co.

PRESSURE RECORDERS, Bellows
American Meter Co.
Bailey Meter Co.
Bridgeport Thermostat
Bristol Co.
Brown Inst. Co.
Cook Electric
Crosby Steam Gage
Dickson Co.
Esterline-Angus Co.
Foxboro Co.
Gorrell & Gorrell
Gotham Inst. Co.
Hays Corp.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Weksler Thermometer

PRESSURE RECORDERS, Bourdon tube
American Meter Co.
Avion Instrument
Bailey Meter Co.
Baldwin Locomotive
Bristol Co.
Brown Inst. Co.
Electro Products Lab.
Builders-Providence
Crosby Steam Gage
Dickson Co.
Esterline-Angus Co.
(Cont'd)

PRESSURE RECORDERS, Bourdon tube (Cont'd)
Foxboro Co.
Gordon Co., Claud S.
Gotham Inst. Co.
Hays Corp.
Improved Gauge Mfg. Co.
Kenyon Instrument Co.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thrush & Co., H. A.
Trerice Co.
U. S Gauge
Weksler Thermometer

PRESSURE RECORDERS, Capsular spring
Cook Electric
Manning, Maxwell & Moore
Republic Flow Meters
Tagliabue Div.

PRESSURE RECORDERS, Diaphragm
Avion Instrument
Bailey Motor Co.
Bristol Co.
Brown Inst. Co.
Cook Electric
Dickson Co.
Electro Products Labs.
Foxboro Co.
Gotham Inst. Co.
Hays Corp.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Tagliabue Mfg. Co.
Taylor Inst. Co.
Waugh Labs.
Wheelco Instruments

PRESSURE RECORDERS, Electrical-resistance
Baldwin Locomotive
Hathaway Instrument
Raytron, Inc.
Republic Flow Meters
Statham Labs.
Trimount Inst. Co.
Waugh Labs.

PRESSURE RECORDERS, Inverted-bell
American Meter Co.
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Dickson Co.
Foxboro Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Taylor Inst. Cos.
Uehling Instrument Co.

PRESSURE RECORDERS, Membrane
Bailey Meter Co.
Mason-Neilan Regulator
Republic Flow Meters
Taylor Inst. Co.

PRESSURE RECORDERS, Piezoelectric
Brush Development Co.
Massa Labs.
RCA Manufacturing Co.
Waugh Labs.

PRESSURE RECORDERS, Piston, weight-loaded
Bailey Meter Co.

PRESSURE RECORDERS, Single-tube liquid column
Trerice Co.
Uehling Instrument Co.

PRESSURE RECORDERS, Spring-loaded piston
Bacharach Indus. Inst.
Baldwin-Southwark Corp.
Commercial Research
Esterline-Angus Co.

PRESSURE RECORDERS, U-tube
Bailey Meter Co.
Brown Inst. Co.
Foxboro Co.
Gorrell & Gorrell
Manning, Maxwell & Moore
Mason-Neilan Regulator
Republic Flow Meters
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.

PRESSURE SNUBBERS
American Meter Co.
Ashton Valve Co.
Brown Inst. Co.
Campbell Co., J. A.
Fischer & Porter
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp.
Martin Decker Corp.
McAlear Mfg. Co.
Meriam Co.
National Engg. Prods.
Parker Appliance

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American Optical
Bausch & Lomb Opt.
Binswanger & Co.
Boehmke Optical Co.
Buchele Optical Co.
Cadilac Glass Co.
Clark & Sons
Dearborn Scientific
Eclipse-Pioneer Div.
Fish-Schurman Co.
Fecker, J. W.
Flett Laboratory
Fuess, Inc.
Gaertner Scientific Corp.
Geophysical Inst. Co.
Glendale Optical
Goerz Amer. Optical Co.
Hayward Optical Glass
Henson Co., Fred C.
Jarrell-Ash Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Machlet & Son
Optron Laboratory
Perkin-Elmer Corp.
(Cont'd)

PRISMS (Cont'd)
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Robinson Optical
Schneider-Cogswell
Simpson Optical
Swain Nelson Co.
Univis Lens Co.
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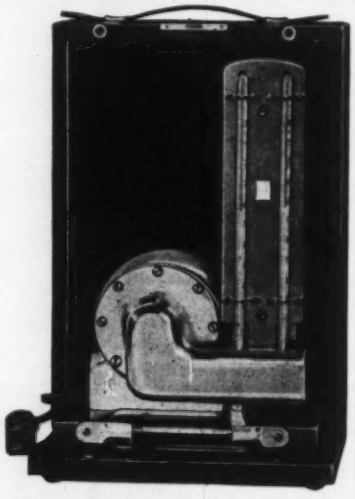

with this aspirating psychrometer.

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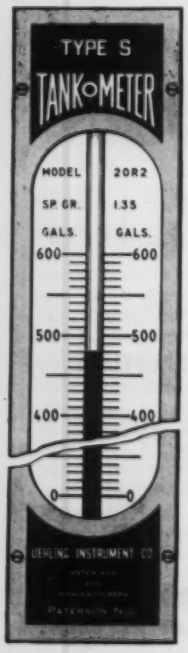

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INSTRUMENTS FOR MEASURING
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BAROMETRIC PRESSURE
ABSOLUTE PRESSURE
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VERI-TRON
Model C
The best in automatic, electronic controllers.

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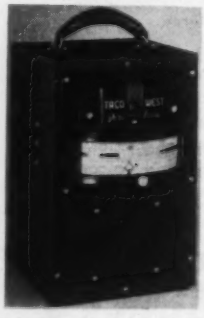
"Guardian" Model L
The Veri-Tron for high or low temperature safety cut-out.

Write for Bulletin L-1



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VERI-TRON types for portable plant uses.

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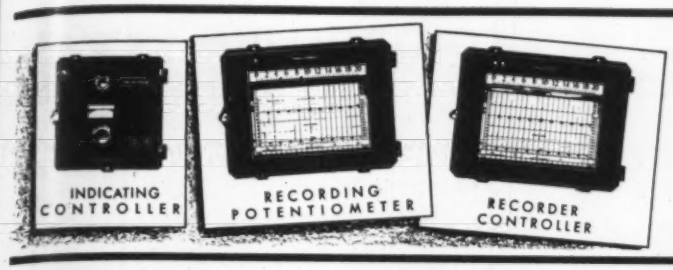
Designs by Theodore A. Cohen



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Better Temperature Control . . .
More Accurate Temperature Record

The simple, modern design of rugged CELECTRAY Pyrometers offers industry—

High Sensitivity Control—Accurate and Fast Recording. Write for Catalog No. 1101-1.

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PROGRAM CLOCKS (See Timers, Automatic Process)
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Bausch & Lomb Optical
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Dome Precision
Eastman Kodak Co.
Leitz, Inc.
RCA Manufacturing
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PROJECTORS, Film Slide, Lantern Slide & Opaque Object
American Meas. Insts.
American Optical
Bausch & Lomb Optical
Bell & Howell Co.
Burton Mfg. Co.
DeVry Corp.
Dome Precision
Eastman Kodak Co.
Fish-Schurman Corp.
G. M. Laboratories
Leitz, Inc.
Pfaltz & Bauer
Zeiss, Inc.

PROJECTORS, Rectifying
Abrams Instrument
PRONY BRAKES, Hydraulic
Taylor Manufacturing
PROTRATORS, Bevel (See Drawing Instruments)
PROTRACTORS, Course
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Bliss & Co.
Kenyon Instrument Co.
Keuffel & Esser Co.
Marine Compass Co.
Negus, T. S. & J. D.
Warren-Knight Co.

PROTRACTORS, Navigator's (See Protractors, Course)
PROTRACTORS, Transparent (See Drawing Instruments)
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Lambert Meter Co., Inc.
Superior Meter Co.
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Pittsburgh Inst. & Mech.
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Stoelting Co., C. H.
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Brown Inst. Co.
Friez & Sons
Fuess, Inc.
(Cont'd)

PYSCHROMETERS, Aspiration (Cont'd)
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Johnson Service Co.
Mason-Neilan Regulator
Moeller Instrument Co.
Palmer Co.
Parks Cramer Co.
PSYCHROMETERS, Electric (See Phychrometers, Aspiration)
PSYCHROMETERS, Recording (See Hygrometers, Recording)

PYROMETERS

Bristol's line of pyrometers includes potentiometer, millivoltmeter, thermocouple and radiation types for temperatures up to 3600°F.; automatic controllers, recorders and indicators; electronic pyrometer controllers. For complete details, including advantages of Bristol's Pyrometers and Pyrometer accessories, write for Bulletins PI200, PB1226, PB1217, PB-1213, and PI202. The Bristol Co., 113 Bristol Road, Waterbury 91, Conn.

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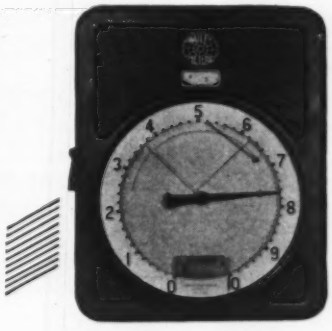
ENGINEERS PROCESS CONTROL FOR BETTER PRODUCTS AND PROFITS



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Electronic Pyrometer

● This indicating, recording, and controlling BAILEY PYROTRON is a self balancing potentiometer which records one or two temperatures continuously on a 12-inch diameter chart and indicates on a 29-inch bold scale. It may be furnished with air-operated, electric, or electronic control.

A thermocouple or radiation unit is the temperature sensitive element.

Minimum maintenance is insured by elimination of galvanometers, millivolt meters, and continuously moving or vibrating mechanisms. A reversible electric motor under electronic control, balances the potentiometer network and drives the indicating, recording and controlling features.

Bailey Pyrotron Recorder-Controllers are made up of interchangeable assemblies, standardized so that only a few spare parts need be carried in stock to provide replacements for many instruments. Ask for Bulletin 232.

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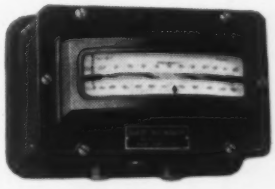
Bailey Meter Company Ltd., Montreal, Canada

Wall-Type INDICATOR PYROMETER

A PRODUCT OF 40 YEARS OF RESEARCH



Model W-1
Switchboard Indicator

Unskilled help may handle this direct-deflection instrument, which needs no manual adjustment. Designed for numerous ranges of temperature, both F. and C.

Write for descriptive Bulletin 400

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CAMBRIDGE PYROMETERS

Roll . . . Needle . . . Mold

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CAMBRIDGE COMBINATION PYROMETERS enable quick, accurate temperature checks of materials in a plastic or semi-plastic state . . . or of flat and curved surfaces, moving and stationary . . . or of mold cavities. Three thermocouples, quickly interchangeable, give this single instrument many applications. Ranges up to 900°F. Single-purpose pyrometers also available. **EXTENSION MODEL SURFACE PYROMETER** (ranges up to 1600°F.) is indispensable for hard-to-reach places.

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Because they are made in various models; used with various temperature detectors; and for either pneumatic or electric control; Micromax and Speedomax Pyrometers and L&N Optical Pyrometers offer a comprehensive choice from which equipment can be selected to meet practically any temperature-control problem in any industry. Catalogs on request.

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Fries & Sons
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Johnson Service Co.
Laboratory Specialties
Mine Safety App. Co.
Moeller Instrument Co.
Palmer Co.
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Scientific Inst. Co.
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Central Scientific Co.
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Hellige, Inc.
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Photovolt Corp.
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Rieker Inst. Co.
Rubicon Co.
Scientific Glass App.
Taylor & Co., W. A.

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(See Pressure Snubber)

PULVERIZED MATERIALS MEASUREMENTS
(See Granular Materials)

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Chicago Apparatus Co.
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Eclipse-Pioneer Div.
Fredericks Co., Geo.
Machlett & Son
Phoenix Prec. Inst.
Precision Scientific
Refinery Supply Co.
Scientific Glass App.
Sterling Eng. Co.
National Research
Nelson Vacuum Pump
Stoelting Co., C. H.
Stokes Machine Co.
Uehling Inst. Co.
Welch Scientific

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Easton Engineering
Eclipse-Pioneer Div.
Hydraulic Controls, Inc.
Penberthy Injector Co.
Precision Scientific
Sundstrand Machine Tool

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Eppley Lab.
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Pyrometer Inst. Co.

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Cambridge Inst. Co.
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Leeds & Northrup Co.
Lewis Engineering
Pyrometer Inst. Co.
Rubicon Co.
Taco West Corp.
Tagliabue Mfg. Co.
Thwing Albert Inst. Co.

PYROMETERS, Electrical Resistance
Assembly Products
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Brown Inst. Co.
Cambridge Inst. Co.
Dickson Co.
Electric Hotpack Co.
Engelhard, Chas.
Ferner Co.
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General Elec. Co.
Gordon Co., Claud S.
Gray Instrument
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J-B T Insts., Inc.
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Pyrometer Inst. Co.
Roller-Smith Co.
Rubicon Co.
Taco West Corp.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Wheelco Inst. Co.

PYROMETERS, Expansion
Burling Instrument Co.
Defender Automatic Reg.
Ferner Co.
Lewis Enginering
Partlow Corp.
Pyrometer Inst. Co.
Taco Enginering
Tagliabue Mfg. Co.
Wheelco Insts. Co.
Thwing Albert Inst. Co.
Wheelco Insts. Co.

PYROMETERS, Indicating
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Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Burrell Tech. Supply
De Jur-Amsco
Electric Hotpack Co.
Electronic Prod. Co.
Elematic Equip. Corp.
Engelhard, Chas.
Foxboro Co.
Gordon Co., Claud S.
Gray Instrument
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Leeds & Northrup Co.
Lewis Engg. Co.
Meters, Inc.
Partlow Corp.
Pyrometer Inst. Co.
Roller-Smith Co.
Rubicon Co.
Taco West Corp.
Tagliabue Mfg. Co.
Tamms Silica Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Millivoltmetric
Bristol Co.
Brown Inst. Co.
Burrell Tech. Sup.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Elematic Equip. Corp.
(Cont'd)

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Engelhard, Chas.
Foxboro Co.
General Elec. Co.
Gordon Co., Claud S.
Gray Instrument
Ill. Testing Labs.
J-B-T Instruments
M B Instruments
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Pyrometer Instr. Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Taco West Corp.
Tamms Silica Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

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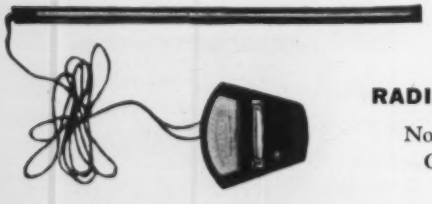
Bacharach Indus. Inst.
Brown Inst. Co.
Burrell Technical Supply
Cambridge Inst. Co.
Dietert Co.
Fisher Scientific Co.
Gordon Co., Claud S.
Leeds & Northrup Co.
Lewis Engineering
Pyrometer Instr. Co.

PYROMETERS, Portable
Bacharach Indus. Inst.
Bristol Co.
Brown Inst. Co.
Burrell Technical Supply
Cambridge Inst. Co.
De Jur-Amsco
Elematic Equip. Corp.
(Cont'd)



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for Checking
Pyrometers
and
Thermocouples
of any
Make or Kind

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Indicating
Recording
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Stock Ranges from 1400°F to 7500°F Write for Catalog #80

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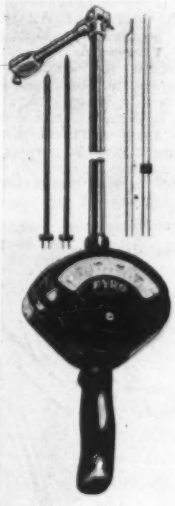
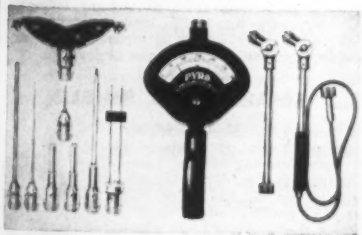
Constructed in a shock, moisture and dust-proofed shielded steel housing, it is immune to external magnetic influences and will withstand the roughest handling. "Bare metal" and "Protected" type thermocouples instantly interchangable. Other features include the new, large 4½" direct read-ind indicator, automatic cold end junction compensator and lock swivel.



Ranges 0-1500°F and 0-2500°F

Our Catalog #150 will interest you



The **NEW PYRO** all-purpose **Surface** Pyrometer has been designed to meet all plant and laboratory surface and subsurface temperature measurement requirements. Available in five temperature ranges from 0-300°F to 0-1200°F with a selection of eight types of interchangeable thermocouples and two extension arms. Also features automatic internal cold end junction compensator, shock, moisture and dust-proofed shielded steel housing.

Write for Catalog #160

THE PYROMETER INSTRUMENT CO.

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Foxboro Co.
Gordon Co., Claud S.
Gray Instrument
Hoskins Mfg. o.
Ill. Testing Labs.
Instrument Lab., Inc.
J B-T Instruments
Leeds & Northrup Co.
Lewis Engg. Co.
Meters, Inc.
Pyrometer Instr. Co.
Pyrometer Service Co.
Rubicon Co.
Roller Smith Co.
Tagliabue Mfg. Co.
Tamms Silica Co.
Thwing-Albert Instrument
Whelco Inst. Co.

PYROMETERS, Potentiometric
Bailey Meter Co.
Brown Inst. Co.
Bristol Co.
Cambridge Inst. Co.
De Jur-Amsco
Dickson Co.
Foxboro Co.
Gordon Co., Claud S.
Lewis Engg. Co.
Gray Instrument
Leeds & Northrup Co.
Pyrometer Inst. Co.
Rubicon Co.
Tagliabue Div.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Radiation, Controlling
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Bacharach Indust. Inst
Cambridge Inst. Co.
Engelhard, Chas.
Foxboro Co.
General Elec. Co.
Gordon Co., Claud S.
Ill. Testing Labs.
Leeds & Northrup Co.
Pyrometer Inst. Co.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Radiation, Indicating
Bachrach Industrial Inst.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
General Elec. Co.
Leeds & Northrup Co.
Pyrometer Inst. Co.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Radiation, Recording
Bachrach Industrial Inst.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
General Elec. Co.
Gordon Co., Claud S.
Leeds & Northrup Co.
Pyrometer Inst. Co.
Thwing-Albert-Instrument

PYROMETERS, Thermo-electric, Immersion
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Cambridge Inst. Co.
De Jur-Amsco
Elematic Equip. Corp.
Engelhard, Chas.
Ferner Co.
Foxboro Co.
General Elec. Co.
Gordon Co., Claud S.
Gray Instrument
Illinois Testing Labs.
J-B-T Insts., Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
L. H. Marshall
Meters, Inc.
Partlow Corp.
Pyrometer Inst. Co.
Pyrometer Service Co.
Roller-Smith Co.
Taco West Corp.
Tagliabue Div.
Thwing-Albert Instrument
Wheelco Instruments

PYROMETERS, Thermo-electric, Indicating
Assembly Products
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Electro-Tech Equip.
Elematic Equip. Corp.
Engelhard, Chas.
Ferner Co.
Foxboro Co.
Gordon Co., Claud S.
Gray Instrument
Hebler Co.
(Cont'd)

PYROMETERS, Thermo-electric, Indicating (Cont'd)
Ill. Testing Labs.
J-B-T Insts., Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
Meters, Inc.
Partlow Corp.
Pyrometer Inst. Co.
Roller-Smith Co.
Rubicon Co .
Scientific Inst. Co.
Taco West. Corp.
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Instrument
Western Inst. Co.
Wheelco Inst. Co.

PYROMETERS, Thermo-electric, Recording & Controlling
Bacharach Indust. Inst.
Bailey Meter Co.
Beck Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Engelhard, Chas.
Foxboro Co.
General Elec. Co.
Gordon Co., Claud S.
Ill. Testing Labs.
Leeds & Northrup
Lewis Engg. Co.
Mason-Neilan Regulator
Partlow Corp.
Pyrometer Inst. Co.
Taco West Corp.
Tagliabue Div.
Thwing-Albert Instrument

PYROMETERS, Thermo-electric, Surface Contact
Bailey Meter Co.
Bristol Co.
Cambridge Inst. Co.
Elematic Equip. Corp.
Engelhard, Chas.
Ferner Co.
Foxboro Co.
General Elec. Co.
Gordon Co., Claud S.
Gray Instrument
J-B-T Instruments
Laboratory Specialties
Lewis Engg. o.
Pyrometer Inst. Co.
Pyrometer Service Co.
Schweitzer & Conrad
Taco West Corp.
Tagliabue Div.
Tamms Silica Co.
Thwing-Albert Instrument
Wheelco Instruments

PYROMETRIC CONES (See Cones, Pyrometric-

Q METERS
Boonton Radio
Freed Transformer
General Electric Co.

QUARTZ, Fused Quartz Apparatus
Crystal Research Labs.
Distillation Products
General Electric Co.
Hanovice Chem. & Mfg.
Microchemical Service
Thermal Syndicate Ltd.
Unertl Optical Co.

RADIO ACTIVITY MEASURING INSTRUMENTS
Berkeley Scientific
Canadian Radium
Cyclotron Specialties
Geophysical Instrument
Herbach & Rademan
Instrument Div. Labs.
Martin-Hubbard Corp.
Radiation Counter Labs.
Sylvania Electric
Technical Associates
Tracerlab, Inc.
Victoreen Inst. Co.

RADIO BEACON SYNCHRONIZING CONTROLLERS
Beacon Gage Co.
Federal Telegraph Co.
Islip Radio Mfg.
Radio Receptor Co.
Wallace & Tiernan

RADIO FREQUENCY METERS
Boes Co., W. W.
Burlington Inst. Co.
Cardwell Mfg. Co.
Clough-Brengle Co.
De Jur-Amsco
Electronic Div. Lab.
Electro Products Lab.
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Hewlett-Packard
Hickok Eec. Inst. Co.
Lampkin Laboratories
Measurement Corp.
Milen Mfg. Co.
National Co.
Premier Crystal Labs.
(Cont'd)

RADIO FREQUENCY METERS (Cont'd)
Rawson Electrical Inst.
RCA Div.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Sherron Metallic
Sperry Gyroscope Co.
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RADIO FREQUENCY OSCILLATORS (See Oscillators, Radio Frequency)

RADIO-MICROMETERS (See Micrometers, Radio)

RADIO REMOTE CONTROL SYSTEMS (See Controllers, Automatic, Radio Remote)

RADIO SET ANALYZERS (See Analyzers, Radio Set)

RADIOSONDES
General Elec. Co.
Kollsman Inst. Div.
Reiner Electronics
Serdex, Inc.
Wallace & Tiernan

RADIO TUBE CHECKERS (See Analyzers, Radio Set)

RADIUM DETECTORS see Detectors, Radioactivity

RAIN GAGES
Ballauf Mfg. Co.
Central Scientific Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Gurley, W. & L. E.
Henson Co., Fred C.
Keuffel & Esser Co.
Leupold & Stevens
Precision Therm.
Stewart, M. C.
Taylor Inst. Cos.
Warren-Knight Co.
White Co., Inc.

RAINFALL RECORDERS
Esterline-Angus Co.
Friez & Sons
Fuess, Inc.
Gorrell & Gorrell
Green, Henry J.
Leupold & Stevens
Taylor Inst. Cos.

RANGE FINDING INSTRUMENTS
Bausch & Lomb
Fecker, J. W.
Fisher Research Lab.
Gaertner Scientific Corp.
Hastings Inst. Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Leitz, Inc.
Precision Therm.
RCA Manufacturing
Stafford Co.
White Co., Inc.

RANGE POLES (See Surveying Instruments)

REACTANCE METERS
Brownell, H. Russell
Clarke Inst. Corp.
Electro Products Lab.
Freed Transformer
General Elect. Co.
General Radio Co.
Premier Crystal Labs.
RCA Manufacturing
Rubicon Co.
Sensitive Research Inst.

REACTIVE VOLT-AMPERE METERS, see Volt-ampere Meters, Reactive

READING LENSES, Thermometer & Burette (See Lenses, Reading)

RECORDERS (See object of measurement and control)

RECTIFIERS, Dry Disc
Automatic Elec. Sales
Benwood Linze Co.
Birtcher Corp.
Bradley Labs.
Conant Electrical Lab.
Control Corp.
Dearborn Scientific
Elec. Facilities, Inc.
Federal Telegraph Co.
General Elec. Co.
Mallory & Co.
Mellaphone Corp.
Radio Receptor Co.
Raytheon Mfg. Co.
Richardson-Allen
Schauer Mach. Co.
Selenum Corp.
Standard Elec. Time
Standard Transformer
Sylvania Elec. Prod.
United Transformer Corp.
Westinghouse Elec.

RECTIFIERS, Power
Airdesign, Inc.
Allis-Chalmers
American Transformer
Amplifier Co.
Applied Research Labs.
Automatic Elec. Sales
Benwood Linze
Birtcher Corp.
Bradley Labs.
Cutler-Hammer, Inc.
(Cont'd)

RECTIFIERS, Power (Cont'd)
Dayton Acme Co.
Eclipse Aviation
Elec. Facilities, Inc.
Electro Products Labs.
Electronic Labs., Inc.
Electrons, Inc.
Electro-Tech Equip.
Federal Telegraph Co.
General Elec. Co.
Lewyt Metal Prod.
Mallory & Co.
Mellaphone Corp.
Ratheon Mfg. Co.
RCA Div.
Richardson-Allen
Schauer Mach. Co.
Selenium Corp.
United Transformer Corp.
Westinghouse Elec.

RECTIFIERS, Thermionic
Amplifier Co.
Atomic Instrument
Automatic Elec. Sales
Benwood Linze
Birtcher Corp.
Communication Meas. Lab.
Continental Elec. Co.
Dearborn Scientific
DuMont Labs., Inc., A. B.
Electro Products Labs.
Electrons, Inc.
Eureka X-Ray Tube
Federal Telegraph Co.
General Elec. Co.
Mellaphone Corp.
Ratheon Mfg. Co.
RCA Div.
Richardson-Allen
Sylvania Elec. Prod.
United Transformer Corp.

REDUCING MOTIONS, ENGINE INDICATOR
Bacharach Indust. Inst.
Crosby Steam Gage Co.
Robertson, 3rd, J. L.
Trill Indicator Co.
Trimount Inst. Co.

REFLECTIONMETERS (See Reflectometer)

REFLECTOMETERS
American Inst. Co.
Dearborn Scientific
Fish-Schurman Corp.
Higgins, Charles F.
Leeds & Northrup Co.
Pfaltz & Bauer
Photovolt Corp.

REFLECTORS, Aspherical
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Geophysical Inst. Co.
Optron Laboratory
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Zenith Optical

REFLECTORS, Concave
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Clark & Sons
Dome Precision
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific
Geophysical Inst. Co.
Optron Laboratory
Perkin-Elmer Corp.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Zenith Optical

REFLECTORS, First Surface
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Bray Optical Co.
Clark & Sons
Crystal Research Labs.
Dearborn Scientific
Dome Precision
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific
Geophysical Instrument
Laboratory Specialties
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Zenith Optical

REFLECTORS, Heat Resisting
Am. Telescope Labs.
Bausch & Lomb Optical
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Zenith Optical

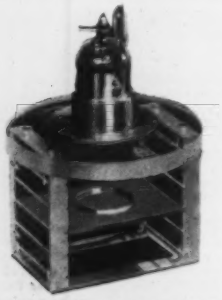
REFLECTORS, Parabolic
Am. Telescope Labs.
Baird Tssociates
Bausch & Lomb Optical
Buchele Optical Co.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific
(Cont'd)

Your Assurance of Satisfaction

RADIATION COUNTER LABORATORIES

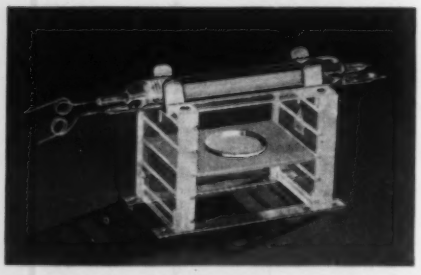
Instruments FOR COUNTING & MEASURING RADIOACTIVITY

In science's newest phase . . . the counting and measuring of radioactivity . . . it is of paramount importance that the instrumentation be of utmost precision and dependability. All products of the Radiation Counter Laboratories, Inc., are trade marked for your identification and assurance of satisfaction.



PRESSURE SEAL MICA WINDOW COUNTER

This assembly includes Model 2A pressure seal, self quenching counter, small lead shield, mount, sliding shelf and 100 sample pans. Recommended especially for the measurement of Carbon 14, Sulphur 35 and other soft beta emitters with maximum energies in the 100 kev. range. Because of the exceptional thinness of the window this counter may also be used to detect alpha particles from all radioactive isotopes.



THIN WALL BETA COUNTER ASSEMBLY

Complete assembly with Thin Wall Beta Counter Model 10A, mount and 100 sample pans. It is a proved time-tested self-quenching counter. Over 4000 of this type have been used successfully. The silver cathode is of high work function and has negligible photosensitivity.

SCOTT TYPE MICA WINDOW COUNTER

This counter is a development of our Mr. Benj. F. Scott. The Scott Type Mica Window Counter is highly sensitive, ruggedly built for long life. Moderately priced and adequate for most uses.

THIN WALL SOCKET BETA COUNTER

The Thin Wall Socket Beta Counter has been designed as a high quality counter which may be easily installed in a detecting circuit for quantitively measuring beta or gama radiation. The cathode has a high work function and negligible photosensitivity. This counter can be plugged in as simply as a radio tube.

THIN WALL BETA COUNTER

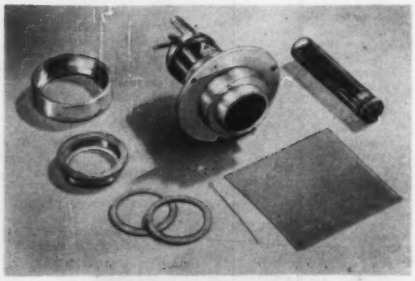
The Thin Wall Beta Counter is the same counter that is supplied in the Thin Wall Beta Counter assembly. It is offered separately for those who might not need the complete assembly.

BRASS WALL COUNTER

This self-quenching counter is suitable for measuring cosmic rays and gamma radiation.

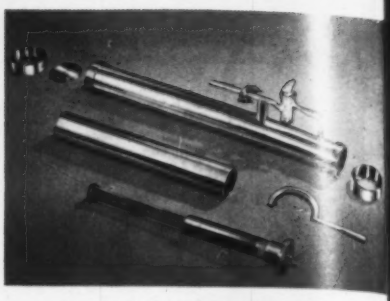
BF_3 NEUTRON COUNTER

For detecting slow neutrons. Operating region 1700-2100 volts at 12 cm pressure. Characteristic curve very flat, purity of Boron Trifluoride better than 99%. Reduced to a minimum are HF, HCl and SiF_4. Available in 2 Standard models: 12 cm pressure and 40 cm pressure.



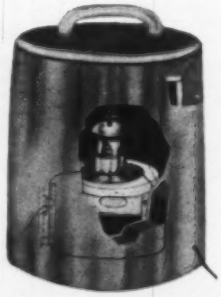
PRESSURE SEAL MICA WINDOW COUNTER KIT

This kit contains a fused kovar to glass seal terminating in a substantial contact lug, two lead gaskets, beaded center wire, mica, ring seal, nut, spanner wrench, vial of clear glyptal and instructions for assembly. Finished counter similar to Pressure Seal Mica Window Counter.



LIBBY SCREEN WALL COUNTER

For the measurement of radioactive samples of low specific activity and for the measurement of very soft radiations which are greatly attenuated by passage through even thin counter windows the Libby Screen Wall Counter is an indispensable instrument. All types of particle radiation can be counted: alpha particles, beta particles and conversion (Auger) electrons. It is approached in sensitivity only by Gas Sample counters and the use of the latter is, of course, drastically limited to those few materials which can be obtained in a suitable gaseous form. Even for some of these materials the Screen Wall Counter has a greater ultimate sensitivity because the possibility of using a considerably larger sample compensates for losses due to self absorption.



VERTICAL LEAD SHIELD

This shield is the accepted standard for shielding Mica Window Counters against cosmic and other types of radiation. It is fabricated from virgin lead one and one half inches thick. A one eighth inch inner lining of aluminum makes the secondary radiation more mono-energetic.

SMALL LEAD SHIELD

The Small Lead Shield minimizes secondary radiation produced in the environment from gamma emitting samples. This shield is designed for Mark 1, Models 1A and 2A and is used with or without the Vertical Lead Shield. The height is 4⅞ inches, width 2⅝ inches, and wall thickness ⅜ inch. The top lifts off. The cable hole and top serration are at an angle to minimize radiation entering and striking the enclosed counter.

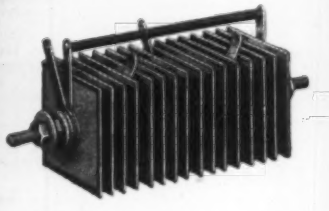
FREE Data Sheets . . .

This is but a condensed presentation of the principal instruments we produce. Write for our current data sheets, price list and a current list of terminology and nomenclature used in radioactivity measurements. No obligation whatsoever.

RADIATION COUNTER *Laboratories Inc.* 1451 E. 57th ST. CHICAGO 37, ILL.

THE BRADLEY LINE

SELENIUM RECTIFIERS



Bradley selenium rectifiers for medium voltage power applications are processed to allow good efficiency and stability at D. C. ratings up to 24 volts per plate. For continuous operation in Full Wave Circuit cooled by naturally circulating air at 35°C ambient, current density is conservatively fixed at 0.333 amperes per square inch of plate.

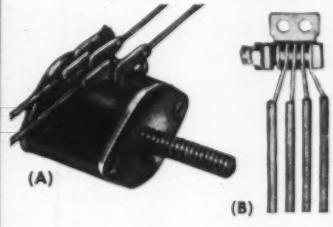
For power applications, square plates allow a maximum ratio of rating to space factor.

For high voltage electronics applications, Bradley selenium rectifiers are rated up to 70 volts peak inverse per plate. Current ratings are available as low as 500 microamperes with special designs available with even lower current ratings for high frequency applications.

Rectification problems in instruments, electronic devices, control devices, and power applications have been readily met by Bradley engineers, who can quickly specify the proper selenium or copper oxide rectifier for your application.

● Above, SE-11 series. Power rectifier stacks rated from 0.100 amperes up. Plate size starts at 1" x 1".

COPPER OXIDE RECTIFIERS



Bradley "Coprox" instrument rectifiers have vacuum processed pellets with gold contacts.

Exhaustive laboratory and field tests have proved our process produces rectifiers with maximum efficiency and minimum temperature errors. Even under severe conditions of use, aging is practically eliminated.

Electrical instruments with better accuracy are being built with "Coprox" rectifiers.

Designed for low voltage applications, Bradley "Coprox" Power Rectifiers are rugged, compact and conservatively rated. Long service life is combined with low operating cost.

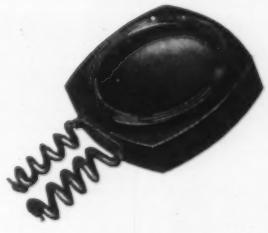
All lead wires on Bradley "Coprox" rectifiers are pre-soldered and other types of terminals are specially designed to prevent overheating during assembly. Perfect sealing is achieved by wax potting or plastic impregnating. Mountings are exceptionally adaptable. All "Coprox" rectifiers have conservative ratings.

Bradley's applications experience can help you use rectifiers to advantage and can be called upon for the development and production of special designs for special jobs. Use of Bradley "Coprox" rectifiers will result in more efficient equipment that will stand up longer in service.

●Above (A) CX-4D series. High conversion ratio rectifier for electronic control and instrument work, rated from 25 milliamperes to 100 milliamperes, and up to 12 volts, A. C. Supplied with 3" flexible leads. Completely enclosed housing-size 7/8" x 3/4", from 1/2" long to 2" long. Mounts on a single 6/32" screw, 1/2" long.

●Above (B) CX-2E series. Instrument rectifiers rated up to 4.5 volts A. C., 3 volts D. C., 5 milliamperes D. C. Available for all conventional circuits and for special current control applications. Size 7/16" x 1/4" x 3/8", 3" flexible leads. Two 3/32" diameter mounting holes.

PHOTO ELECTRIC CELLS



Bradley's Luxtron* photocells efficiently convert light into electric energy sufficient to operate meters and sensitive relays without any external power source. Lightweight, rugged and true to rating, they give long life under the most strenuous operating conditions.

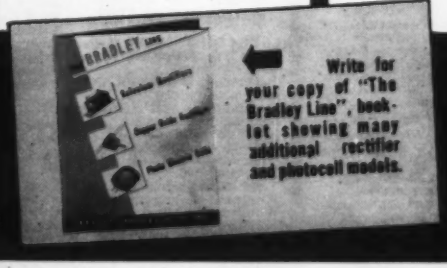
Luxtron photocells are, so far as we have been able to determine, the very finest on the market although priced with inferior grades.

Shapes of Luxtron photocells vary from circles to squares, with every in-between shape desired. In size they range from the diminutive to the largest sizes required.

For precision control of light into electric energy, specify Luxtron photocells. Write Bradley today for samples and engineering assistance on any photocell problem you have in mind.

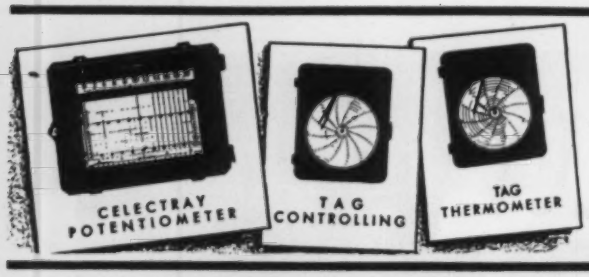
● Above, the pigtail contact model shown here is only one of a series of standard mountings. Others include housed models with plug-in contacts, tube socket and nut-and-bolt types.

*T.M. Reg. U.S. Pat. Off.



BRADLEY LABORATORIES, INC.

82 MEADOW STREET, NEW HAVEN 10, CONN.



TAG RECORDERS

There is an instrument included in this group that is desi ed to record all temperatures from minus 200° C. up, and all i dustrial pressures.

Ask for catalogs . . . they graphically suggest the usefu ss of Celectray Recording Potentiometer Pyrometer, TAG Re rding Thermometer and Recording Pressure Gages for servi and economy in your plant and laboratory.

C. J. TAGLIABUE MFG. CO. **549 PARK AVE., BROOKLYN 5, N. Y.**

Subsidiary of Portable Products Corporation

TAG

REFLECTORS, Parabolic (Cont'd)
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unerti Optical Co.
Unerti Optical Co.
Weber Bros. Metal Works
Zenith Optical

REFLECTORS, Spherical
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Buchele Optical Co.
Fecker, J. W.
Fuess, Inc.
Fish-Schurman Co.
Gaertner Scientific
Geophysical Inst. Co.
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unerti Optical Co.
Zenith Optical

REFLECTORS, Stellite
Acme Industrial
American Telescope Labs.
Bausch & Lomb Optical
Gaertner Scientific
Geophysical Inst. Co.
Kollmorgen Optical Co.
Optron Laboratory
Perkin-Elmer Corp.
Zenith Optical

REFRACTOMETERS
American Optical
Applied Physics Corp.
Bausch & Lomb Optical
(Cont'd)

REFRACTORS (Cont'd)
Central Scientific Co.
Dearborn Scientific
Fish-Schurman Corp.
Fuess, Inc.
Gaertner Scientific
Jarrell-Ash Co.
Photovolt Corp.
Polarizing Instrument
Precision Scientific
Zeiss, Inc., Carl

REFRACTORY TUBES
Coors Porcelain Co.
Wheatstone Corp.

REGULATORS, AUTOMATIC (See Controls, Automatic; and object of measurement and control)

REGULATORS, AUTOMATIC, Air
Acme Regulator Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Bastian-Blessing Co.
Beifield Co.
Black Mfg. Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co
Cash Co.
Conoflow Corp.
Cutler-Hammer, Inc.
Davis Reg. Co.
D'Este Division
(Cont'd)

REGULATORS, Automatic, Air (Cont'd)
Detroit Lubricator
Fisher Governor Co.
Fisher & Porter
Foster Engg. Co.
Foxboro Co.
Friez & Sons
Fulton Syphon Co.
General Controls
General Elec. Co.
Grove Regulator
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Hoke, Inc.
Johnson Service Co.
Judson Governor Co.
Kiely & Mueller
Klipfel Mfg.
Lammert & Mann Co.
Leslie Co.
Linde Air Products Co.
Manning, Maxwell & Moore
Mason Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Mercoid Corp.
Mercon Regulator Co.
Moore Products
National Airoil Burner
Natural Gas Equipment
Northern Equip. Co.
Norwalk Valve Co.
Parks-Cramer Co.
Partlow Corp.
Payne Furnace & Supply
Penn Electric Switch Co.
Pgh. Equitable Meter
Powers Regulator Co.
(Cont'd)

REGULATORS, Automatic, Air (Cont'd)
Preferred Utilities Mfg.
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Ruggles-Klingemann
Sampsel Time Control
Schade Valve Mfg.
Seely Inst. Co.
Selas Co.
Shallcross Controls
Sprague Meter Co.
Spence Engineering Co.
Tagliazue Div.
Taylor Inst. Cos.
Trerice Co.
Vaughn-G. E. Witt Co.
Victor Equipment Co.
Watts Regulator Co.
White-Rodgers Electric
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Atmospheric
American Meter Co.
Cash Co.
D'Este Division
Foxboro Co.
General Controls
Hagan Corp.
Hammell-Dahl Co.
Mason-Neilan Regulator
Parks-Cramer Co.
Powers Regulator Co.
Robertsthaw Thermostat

REGULATORS, AUTOMATIC, Boiler
A-Jacks Automatic
Askania Regulator Co.
Bailey Meter Co.
Brooke Eng. Co.
Brown Inst. Co.
Campbell Co., J. A.
Cash Co.
Douglass Aptomatic
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
General Controls
General Regulator Corp.
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Henszey Co.
Leeds & Northrup
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator
Minneapolis-Honeywell
National Brass Co.
Natural Gas Equipment
Penn Electric Switch
Perfex Corp.
Republic Flow Meters
Robertshaw Thermostat
Ruggles-Klingemann
Shallcross Controls
Tagliabue Div.
Watts Regulator Co.
White Rodgers Elec.
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Compressed Gas
American Meter Co.
Askania Regulator Co.
Bailey Meter Co.
Bastian-Blessing
Black Mfg. Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Conoflow Corp.
D'Este Division
Electrimatic Corp.
Fischer & Porter
Fisher Governor Co.
Foxboro Co.
Frick Co.
General Controls
Grove Regulator
Hammel-Dahl Co.
Hays Corp.
Hoke, Inc.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Moore Products
Natural Gas Equipment
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Schade Valve Mfg. Co.
Shallcross Controls
Tagliabue Div.
Victor Equipment Co.
(Cont'd)

REGULATORS, AUTOMATIC, Condensation (See Controllers, Automatic, Condensation)

REGULATORS, AUTOMATIC, Consistency (Paper & Pulp) (See Controllers, Automatic, Consistency)

REGULATORS, AUTOMATIC, Current
Abrams Instrument . . .
Amperite Corp.
Amplifier Co.
Askania Regulator Co.
Automatic Elec. Sales
Automatic Temp. Control
Beck Bros.
Betts & Betts
Bradley Laboratories
Burlington Inst. Corp.
Clarostat Mfg. Co.
Cook Electric
Cutler-Hammer, Inc.
DoAll Co.
Eclipse-Pioneer Div.
General Controls
General Elec. Co.
Hagan Corp.
Monitor Controller Co.
Robertshaw Thermostat
Roller-Smith Co.
Rowe Radio Research
Sherron Metallic
Sola Electric Co.
Sorensen & Co.
Standard Arcturus
Thordarson Elec. Mfg.
United Transformer
Varo Mfg. Co.
Westinghouse Elec.
Wheelco Instruments

REGULATORS, AUTOMATIC, Damper (See Controllers, Automatic, Damper)

REGULATORS, AUTOMATIC, District (See Governors, District)

REGULATORS, AUTOMATIC, Draft (See Controllers, Automatic, Draft)

REGULATORS, AUTOMATIC, Drying Chamber
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bristol Co.
Foxboro Co.
Fulton-Sylphon Co.
General Controls
Hagan Corp.
Powers Regulator Co.
Trerice Co.
United Elec. Controls

REGULATORS, AUTOMATIC, Feed Water (see Controllers, Automatic, Feed Water)

REGULATORS, AUTOMATIC, Flow (See Controllers, Automatic, Flow)

REGULATORS, AUTOMATIC, Flow Proportioning (See Controllers, Automatic, Flow Proportioning)

REGULATORS, AUTOMATIC, Fluid Proportioning (See Controllers, Automatic, Fluid Proportioning)

REGULATORS, AUTOMATIC, Frequency
Allis-Chalmers
Burlington Inst. Corp.
General Controls
General Elec. Co.
Kellogg Switchboard
Leeds & Northrup
Pitometer Log Corp.
Varo Mfg. Co.
Telechron Inc.
Varo Mfg. Co.
Westinghouse Elec.
Wheelco Inst. Co.

REGULATORS, AUTOMATIC, Furnace (See Controllers, Automatic, Furnace)

REGULATORS, AUTOMATIC, Gas (See Regulators, Automatic, Air)

REGULATORS, AUTOMATIC, Humidity (See Controllers, Automatic, Humidity)

REGULATORS, AUTOMATIC, Liquid Level (See Controllers, Automatic, Liquid Level)

REGULATORS, AUTOMATIC, Load
Allis-Chalmers Mfg. Co.
Autom'c Valve Controller
Burlington Inst. Co.
Fisher-Pierce Co.
Foxboro Co.
General Controls
Hagan Corp.
Hays Corp.
Leeds & Northrup Co.
Leslie Co.
Norcross Corp.
Pittsburgh Equitable Meter
Robinette Co., W. C.
Taylor Inst. Cos.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Oil Feed
Ace Instrument Co.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Brooke Engineering
Brown Inst. Co.
Cash Co.
D'Este Co.
Fischer & Porter
Fisher Governor
Foster Engg. Co.
General Regulator Corp.
Hagan Corp.
Hays Corp.
Lammert & Mann Co.
Leslie Co.
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
National Airoil Burner
Republic Flow Meters
Sampsel Time Control
Spence Engineering Co.
Tagliabue Div.
Taylor Inst. Cos.
United Cinephone Corp.
Vaughn-G. E. Witt Co.
Wilgus Manufacturing

REGULATORS, AUTOMATIC, Phase
Allis-Chalmers
Clarke Inst. Corp.
General Controls
Kollsman Instrument
Westinghouse Elec.

REGULATORS, AUTOMATIC, Power Factor
Allis-Chalmers Mfg. Co.
General Controls
Leeds & Northrup Co.
Shallcross Controls
Sorensen & Co.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Pressure (See Controllers, Automatic, Pressure)

REGULATORS, AUTOMATIC, Pump
Allen-Bradley Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Control
Automatic Temp. Control
Bailey Meter Co.
Beck Co.
Belfield Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cash Co.
Davis Reg. Co.
D'Este Division
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Fulton Sylphon Co.
Furnas Electric Co.
General Regulator Corp.
Hagan Corp.
Hammel-Dahl Co.
Henszey Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
(Cont'd)

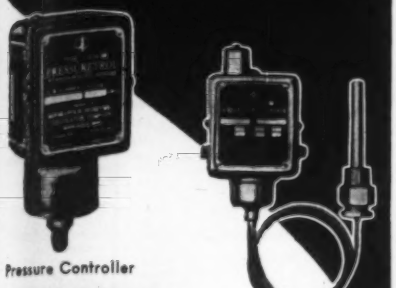
Rocklike
STABILITY—Positively no "drift"
Knife-edge
SENSITIVITY—"Dead spot" eliminated

SPECIFICATIONS—TYPE H-10 REGULATOR
Body: Forged brass; *Trim:* Stainless Steel
Diaphragm: Nylon inserted Neoprene
Size: ¼" NPT; *Ranges:* 0-25 psi; 10-60 psi
Dimensions: Diameter 3"—height 4¼"
Mounting: Plain or panel mounting (shown above)

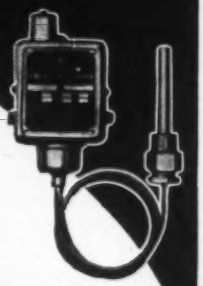
INDUSTRIAL
Cono Controls
PNEUMATIC
CONOFLOW CORPORATION
2100 ARCH STREET PHILADELPHIA 3, PENNA.

REGULATORS

Non-Indicating Type for Temperature, Pressure, Humidity, etc.

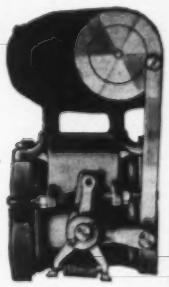


Pressure Controller



Non-Indicating Temperature Controller

Motorized Globe Valve



Motorized Butterfly Valve

In hundreds of applications throughout Industry, these inexpensive non-indicating regulators are doing an efficient job of controlling process variables. As products of Minneapolis-Honeywell, they are backed by 200 years of cumulative experience devoted entirely to controls.

Supplied as either electric or pneumatic controllers, M-H Regulators can be used to operate most sizes and types of control valves.

TEMPERATURE CONTROLLERS

Remote bulb or direct immersion types. For temperatures up to 700°F.

PRESSURE CONTROLLERS

Bellows-operated types. For pressures ranging from 15 lbs. vacuum to 300 lbs. pressure.

CONTROL MOTORS AND MOTORIZED VALVES

Furnished in many different types to fulfill the need of any control installation —electric or pneumatic.

Write for the Brown Control Devices Catalog No. 8302. THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

BROWN INSTRUMENTS
AND
MINNEAPOLIS HONEYWELL CONTROL SYSTEMS

REGULATORS, Automatic, Pump (Cont'd)
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Mercon Regulator Co.
Northern Equip Co.
Penn Electric Switch
Photoswitch, Inc.
Republic Flow Meters
Robinette Co., W. C.
Sampsel Time Control
Schade Valve Mfg. Co.
Spence Engineering Co.
Squires Co.
Tagliabue Div.
Vaughn-G. E. Witt Co.
Water Level Controls Co.
Watts Regulator Co.
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Refrigeration (See Controllers, Automatic, Refrigeration)

REGULATORS, AUTOMATIC, RKVA
Allis-Chalmers Mfg. Co.
Leeds & Northrup
Thordarson Elec. Mfg.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Safety Fuel Shut-Off (See Valves, Automatic, Safety Fuel)

REGULATORS, AUTOMATIC, Steam Pressure (See Controllers, Automatic Pressure)

REGULATORS, AUTOMATIC, Synchronizing
Allis-Chalmers Mfg. Co.
Automatic Elec. Mfg. Co.
Burlington Inst. Co.
Control Corp.
Cutler-Hammer, Inc.
General Controls
Industrial Engr. Corp.
Lear, Inc.
Magnetic Gauge Co.
Shallcross Controls
Westinghouse Elec.

REGULATORS, AUTOMATIC, Temperature (See Controllers, Automatic, Temperature)

REGULATORS, AUTOMATIC, Time (See Controllers, Automatic, Time)

REGULATORS, AUTOMATIC, Vacuum (See Controllers, Automatic, Pressure & Vacuum)

REGULATORS, AUTOMATIC, Viscosity (See Controllers, Automatic, Viscosity)

REGULATORS, AUTOMATIC, Voltage
Allis-Chalmers
American Transformer
Amperite Corp.
Amplifier Co.
Askania Regulator Co.
Automatic Elec. Sales.
Beck Co.
Bradley Laboratories
Burlington Inst. Corp.
Clarostat Mfg. Co.
Clippard Inst. Lab.
Collins Radio Co.
Commercial Research
Communication Meas. Lab.
Control Corp.
Eclipse Aviation
Electronic Associates
Electronic Prod. Co.
Federal Telegraph Co.
Ferris Inst. Corp.
Fredericks, George
General Elec. Co.
Ideal Commuto'r Dresser
International Resistance
Kellogg Switchboard
Miller Co., Bertrand F.
Polarad Electronics
Raytheon Mfg. Co.
Richardson-Allen
Rowe Radio Research
Sherron Metallic
Sola Electric Co.
Sorensen & Co.
Superior Electric
Thordarson Elec. Mfg.
United Transformer Corp.
Ward Leonard Elec. Co.
Westinghouse Elec.
Wheelco Instruments

REGULATORS, AUTOMATIC, Water Pressure (See Regulators, Automatic, Pressure)

REGULATORS, AUTOMATIC, Welding, Gas
Bastian-Blessing Co.
Black Mfg. Co.
Grove Regulator
Hoke, Inc.
Linde Air Products
Victor Equipment Co.

RELAYS, Automatic
Adams & Westlake
Advance Elec. & Relay
Allen-Bradley Co.
American Inst. Co.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Temp. Control
Beck Co.
Clare & Co.

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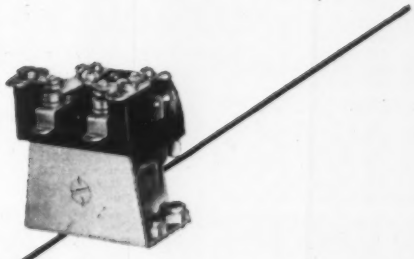

ALLIED RELAYS ON THE LINE

Years of use in flight, firing and communication control equipment . . . mechanical life tests of 100,000,000 operations . . . this is the performance record of the Allied "BO" Relay.

FEATURES:

Dimensions . . . . 1 13/32"x1 5/8"x1 7/8"
Mounting base . . . . . **Small**
Armature . . . . . **Semi-balanced**
Solder terminals . . . . . **At top of relay for convenient wiring**
Stainless steel hinge shaft . . **To minimize friction**

MADE IN THREE DIFFERENT COIL STRUCTURES:

AC Frame . . . . . **up to 220 v 60 cycles**
DC Frame . . . . . **maximum 2.5 watt continuous duty. Coils up to 5,000 ohms**
DC Frame . . . **semi-sensitive at .75 watts, up to 10,000 ohms**
Standard contacts . . . . . **silver to silver**

CONSTRUCTION TYPES:

Rated up to 15 amps. 115 v 60 cycle . .
Double break . . . . . **rated up to 25 amps. 115 v 60 cycle**

OTHER ALLIED RELAYS

Sensitive relays down to 12 milliwatts, and power relays with contact capacities up to 75 amperes, are also available. For information regarding relays to fit your specific needs, write to:

ALLIED CONTROL ★ COMPANY, INC.
2 EAST END AVE. NEW YORK 21, N. Y.
PLANTSVILLE, CONN.

RELAYS, Automatic (Cont'd)
Cook Electric Co.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eastern Industries
Eclipse Aviation
General Contreis Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hagan Corp.
Industrial Eng. Corp.
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Mercoid Corp.
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Potter & Brumfield
Roller-Smith Co.
Struthers-Dunn
Taco Engineering
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Washington Glass Lab.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Capacity-Operated
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch
Automatic Temp. Control
Browning Labs.
Cook Electric
Electronic Lab.
General Controls
Guardian Electric
Kurman Electronics
Lumenite Co.
Potter & Brumfield

RELAYS, Circuit Control
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Inst. Co.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch Co.
Automatic Temp. Control
Beck Co.
Brown Inst. Co.
Clare & Co.
Cook Electric Co.
Cutler-Hammer, Inc.
Eastern Industries
Edison ElectricalControl
Friez Div.
General Controls
General Elec. Co.
Glarian Elec. Mfg. Co.
H-B Instrument
Industrial Timer Corp.
Kellogs Switchboard
Kurman Electronics
Leach Relay Co.
Lumenite Elec. Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Perfex Corp.
Precision Scientific
Potter & Brumfield
Roller-Smith Co.
Sampsel Time Control
Sigma Instrument, Inc.
Struthers-Dunn
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Continuous Current
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Inst. Co.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch
Automatic Temp. Control
Clare & Co.
Cook Electric Co.
Cutler-Hammer, Inc.
General Controls
General Elec. Co.
Guardian Elec. Mfg. Co.
H-B Instrument
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Leach Relay Co.
Paragon Electric Co.
Potter & Brumfield
Sigma Instruments
Struthers-Dunn
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Control
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
American Inst. Co.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
(Cont'd)

RELAYS, Control (Cont'd)
Automatic Switch Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Beck Co.
Betts & Betts
Brown Inst. Co.
Clare & Co.
Control Corp.
Cook Electric Co.
Cutler-Hammer, Inc.
Eastern Industries
Edison Electrical Controls
Fisher-Pierce Co.
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hagan Corp.
H-B Instrument
Industrial Eng. Corp.
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Leach Relay Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
National Time & Signal
Perfex Corp.
Photoswitch, Inc.
Potter & Brumfield
Precision Therm.
Robinette Co., W. C.
Roller-Smith Co.
Sampsel Time Control
Sigma Instruments
Struthers-Dunn
Triplett Elec. Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec.
Weston Elec. Inst. Corp.
White Rodgers Elec.

RELAYS, Current
Adams & Westlake
Guardian Electric
H-B Instrument
Potter & Brumfield
Roller-Smith
Sigma Instruments
Westinghouse Elec.

RELAYS, Demand Totalizing
Autocall Co.
Automatic Elec. Sales
General Elec. Co.
Guardian Electric
Hagan Corp.
Westinghouse Elec.

RELAYS, Electromagnetic
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Inst. Co.
Amperite Co.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Mfg. Co.
Automatic Elec. Sales
Automatic Switch Co.
Bender Warrick
Bunnel & Co.
Control Corp.
Cook Electric Co.
Clare & Co.
Cutler-Hammer, Inc.
Eastern Industries
Eby, Inc.
Friez & Sons
General Elec. o.
G-M Labs.
Gorrell & Gorrell
Guardian Elec. Mfg. Co.
H-B Electric
Industrial Eng. Corp.
Kellogg Switchboard
Kurman Electric Co.
Leach Relay Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Montitor Controller Co.
National Time & Signal
Penn Electric Switch Co.
Perfex Corp.
Phila. Thermometer Co.
Precision Scientific
Precision Therm. & Inst.
Potter & Brumfield
Sigma Instruments, Inc.
Stromberg Time Corp.
Struthers-Dunn
Tork Clock
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Warrick Co.
Western Electro-Mech.
Westinghouse Elec.
Weston Elec. Inst. Corp.
White-Rodgers Electric
Zenith Electric Co.

RELAYS, Electronic
Advance Elec. & Relay Co.
American Inst. Co.
Automatic Elec. Mfg.
Aptomatic Temp. Control
Beck Co.
Bell & Howell
Cardwell Mfg. Corp.
Central Scientific
Clare & Co., C. P.
Coleman Electric
Cook Electric
Cramer Co., Inc.
Cutler-Hammer, Inc.
Davis & Co., Inc., Dean
Echo Electrical
Electronic Dev. Lab.
Electro-Medical Lab.
Ess Instrument
Fisher-Pierce Co.
General Elec. Co.
(Cont'd)

RELAYS, Electronic (Cont'd)
Guardian Elec. Mfg.
Harvey Radio Labs.
Kurman Electronics
Lumenite Co.
Lyman Electronic
Minneapolis-Honeywell
Photoswitch, Inc.
Potter & Brumfield
RCA Div.
Robinette Co., W. C.
Sigma Instruments
Televiso Products
Thordarson Elec. Mfg.

RELAYS, Frequency
Autocall Co.
Automatic Elec. Sales
Automatic Switch Co.
Biddle Co.
Clare & Co., C. P.
Control Corp.
Cook Electric
Cutler-Hammer, Inc.
Esterline-Angus Co.
General Elec. Co.
Guardian Electric
Hickok Electrical Inst.
Kurman Electronics
Potter & Brumfield
Sigma Instruments
Stevens-Arnold Co.
Wallace & Tiernan
Ward Leonard Electric Co.
Westinghouse Elec.

RELAYS, Galvanometer
Assembly Products
Autocall Co.
Automatic Elec. Sales
Automatic Temp. Control
Eby, Inc., Hugh H.
G-M Laboratories, Inc.
Potter & Brumfield
Roller-Smith Co.
Rubicon Co.
Tagliabue Div.

RELAYS, Heavy Duty
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
American Inst. Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch Co.
Automatic Temp. Control
Cook Electric
Cutler-Hammer, Inc.
General Elec. Co.
Kurman Electronics
Miller Co., Bertrand F.
Monitor Controller Co.
Penn Electric Switch
Philadelphia Thermometer
Potter & Brumfield
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zenith Electric Co.

RELAYS, Instrument Controlled
Adams & Westlake
Advance Elec. & Relay
American Inst. Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Beck Co.
Brown Inst. Co.
Carter Radio Div.
Clare & Co.
Cook Electric Co.
Cramer & Co., Inc.
Friez & Sons
General Elec. o.
Guardian Elec. Mfg. Co.
H-B Instrument
Kurman Electronics
Minneapolis-Honeywell
Perfex Corp.
Phila. Thermometer Co.
Potter & Brumfield
Precision Scientific
Precision Therm.
Roller-Smith Co.
Sigma Instruments
Struthers-Dunn
Tagliabue Div.
Tork Clock
Triplett Electrical Inst.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Light Sensitive (See Photoelectric below)

RELAYS, Magnetic (See Relays, Electromagnetic)

RELAYS, Mercury
Adams & Westlake
American Inst. Co.
Autocall Co.
Automatic Elec. Sales
Automatic Temp. Control
Continental Elec. Co.
Guardian Electric
H-B Instrument
Kurman Electronics
Precision Scientific
Precision Therm.
Weston Elec. Inst. Corp.

RELAYS, Mercury Tube
Adams & Westlake
American Inst. Co.
Autocall Co.
Automatic Elec. Sales
Automatic Temp. Control
Brown Inst. Co.
Clare & Co.
Struthers-Dunn
General Controls Co.
(Cont'd)

RELAYS, Mercury Tube (Cont'd)
G-M Labs.
Guardian Elec. Mfg. Co.
H-B Instrument
Kellogg Switchboard
Mercoid Corp.
Minneapolis-Honeywell
Phila. Thermometer
Precision Scientific
Precision Therm.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Motor Driven Time Delay
Advance Elec. & Relay Co.
Allen-Bradley Co.
American Inst. Co.
Automatic Elec. Mfg.
Barber-Colman
Betts & Betts
Clarostat Mfg. Co.
Controls, Inc.
Cramer Co., Inc.
Struthers-Dunn
Friez & Sons
General Controls
General Electric
Guardian Electric
Haydon Co., A. W.
Industrial Eng. Corp.
Industrial Timer
Kurman Electronics
Lumenite Co.
Monitor Controller Co.
Paragon Electric Co.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zenith Electric Co.

RELAYS, Movable Coil A. C.
Advance Elec. & Relay
Esterline-Angus Co.
General Elec. Co.
Kurman Electronics
Roller-Smith Co.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Overload
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch Co.
Automatic Temp. Control
Bunnell & Co.
Burlington Inst. Corp.
Cook Electric
Cutler-Hammer, Inc.
Edison, Instrument Div.
General Elec. Co.
Guardian Elec. Mfg. Co.
Kurman Electronics
Leach Relay Co.
Penn Electric Switch
Potter & Brumfield
Roller-Smith Co.
Sigma Instruments
Standard Elect. Prods.
Struthers-Dunn
Ward-Leonard Elec. Co.
Westinghouse Elec.

RELAYS, Permanent Magnet Movable Coil
Assembly Products
Bunne'l & Co.
Esterline-Angus Co.
General Elec. Co.
Guardian Electric
Kurman Electronics
Roller-Smith Co.
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Photoelectric
Advance Elec. & Relay Co.
American Inst. Co.
Brigham Co.
Clare & Co.
Continental Elec. Co.
Cutler-Hammer, Inc.
Dickson Co.
Eby, Inc.
Electronic Controls
Electronic Dev. Lab.
Electronic Lab.
Electronic Prod. Co.
Ess Instrument Co.
Fisher-Pierce Co.
General Controls Co.
General Elec. Co.
Guardian Electric
Kurman Electronics
Leach Relay Co.
Lumenite Elec. Co.
Photoswitch, Inc.
Precision Therm.
Rehtron Corp.
Rubicon Co.
Sigma Instruments, Inc.
Tagliabue Div.
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Polarized
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Avion Instrument
Bunnell Co., J. H.
Kurman Electronics
L. A. B. Corp.
Miller Co., Bertrand F.
Precision Therm. & Inst.
Sigma Instruments
Stevens-Arnold Co.
Struthers-Dunn
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Power
Advance Elec. & Relay Co.
Allen-Bradley Co.
American Inst. Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch Co.
Cutler-Hammer, Inc.
Esterline-Angus Co.
General Contreis Co.
General Elec. Co.
Hagan Corp.
H-B Electric
Kurman Electronics
Potter & Brumfield
Robinette Co., W. C.
Roller-Smith Co.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Power Factor
Advance Elec. & Relay Co.
Cutler-Hammer, Inc.
Esterline-Angus Co.
Kurman Electronics
L. A. B. Corp.
Potter & Brumfield
Westinghouse Elec.

RELAYS, Resistance, D.c.
Advance E.ec. & Relay Co.
Autocall Co.
Automatic Electric Sales
Bunnell & Co.
Clare & Co., C. P.
Cook Electric Co.
Cutler-Hammer, Inc.
General Elec. Co.
Guardian Electric
Kurman Electronics
Leach Relay Co.
Sigma Instruments
Struthers-Dunn
Ward Leonard Elec. Co.

RELAYS, Stepping
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Clare & Co.
Cook Electric
General Elec. Co.
G-M Laboratories, Inc.
Guardian Electric
Kurman Electronics
Roller-Smith Co.
Struthers-Dunn
Westinghouse Elec.

RELAYS, Telephone Auxiliary Ringing
Advance Elec. & Relay Co.
Autocall Co.
Automatic Elec. Sales
Clare & Co.
Cook Electric
Federal Telegraph Co.
Guardian Electric
Kurman Electronics
Kellogg Switchboard
Leach Relay Co.
Potter & Brumfield
Sigma Instruments
Struthers-Dunn
Western Electro-Mech.

RELAYS, Temperature
Advance Elec. & Relay Co.
Autocall Co.
Automatic Temp. Control
Clare & Co., C. P.
Cook Electric Co.
Edison Elec. Controls
Friez & Sons
General Controls
General Elec. Co.
Gleason-Avery, Inc.
G-M Laboratories, Inc.
Guardian Electric
H-B Instrument
Kurman Electronics
Leach Relay Co.
Minneapolis-Honeywell
Sampsel Time Control
Spencer Thermostat Co.
Struthers-Dunn
Tagliabue Div.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.

RELAYS, Temperature Compensated
Betts & Betts
Guardian Electric
Sigma Instruments
Wallace & Tiernan

RELAYS, Thermal Time Delay
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Am. Gas Accumulator
American Inst. Co.
Amperite Corp.
Autocall Co.
Automatic Elec. Mfg. Co.
Automatic Elec. Sales
Automatic Temp. Control
Betts & Betts
Clare & Co.
Clarostat Mfg. Co.
Cook Electric Co.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.
Echo Electrical
Edison Elec. Controls
Electronic Prod. Co.
Fisher-Pierce Co.
General Controls
General Elec. Co.
Guardian Elec. Mfg. Co.
Industrial Eng. Corp.
Industrial Timer Corp.
Kurman Electronics
Leach Relay Co.
(Cont'd)

RELAYS, Ther... Time Delay (Con...
Lumenite Co.
Magnetic Ga...
Meletron Corp.
Paragon Elec...
Partlow Corp.
Perfex Corp.
Precision The...
Preferred Uti... Mfg.
Roller-Smith ...
Sigma Instrun...
Struthers-Dun...
Ulanet Co., Ge...
Ward Leonard ... Co.
Weston Elec. I... Corp.
Westinghouse ...
White-Rodgers ...ric
Zenith Electric ...

RELAYS, Time ... (See Relays, Ther... Time Delay)

RELAYS, Transf... (Low Voltage)
Advance Elec. & ...lay Co.
Allen-Bradley ...
Auth Elec. Spec...
Automatic Elect... Sales
Barber-Colman
Eclipse Aviation
Friez & Sons
General Controls ...
General Elec. Co.
Gleason-Avery, In...
Guardian Elec. Mfg. Co.
H-B Electric
Industrial Eng. Corp.
Kurman Electronics
Lumenite Co.
Mercoid Corp.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Potter & Brumfield
Sampsel Time Control
Sigma Instruments, Inc.
Struthers-Dunn
Thordarson Elec. Mfg.
Ward Leonard
Warrick Co.
Westinghouse Elec.
White-Rodgers Electric

RELAYS, Vacuum Contact
American Inst. Co.
Edison Instrument Div.
General Elec. Co.
Kurman Electronics
Lumenite Co.

RELAYS, Vacuum Tube
Advance Elec. & Relay Co.
American Inst. Co.
Amperite Co.
Automatic Elec. Sales
Automatic Temp. Control
Continental Elec. Co.
Eby, Inc.
Electro-Medical Lab.
Electronic Dev. Lab.
Electronic Prod. Co.
Fisher-Pierce Co.
General Controls Co.
General Elec. Co.
Harvey Radio Labs.
Kellogg Switchboard
Kurman Electronics
L. A. B. Corp.
Lumenite Co.
Metron Instrument
Precision Therm.
Robinette Co., W. C.
Sigma Instruments
Struthers-Dunn
Tagliabue Div.
Wilson & Co.

RELAYS, Voltage
Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch Co.
Barber-Colman
Clare & Co., C. P.
Cook Electric
Cutler-Hammer, Inc.
Dunn, Inc., Struthers
Eby, Inc., Hugh H.
Esterline-Angus Co.
Ferranti Electric, Inc.
General Controls
General Elec. Co.
Guardian Electric
Hart Manufacturing Co.
Hathaway Inst. Co.
Kurman Electronics
Leach Relay Co.
Potter & Brumfield
Reliance Instrument Co.
Roller-Smith Co.
Sigma Instruments
Sylvania Elec. Prod.
Triplett Electrical Inst.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Electrical Inst.

REMOTE CONTROL EQUIPMENT
Allen-Bradley Co.
Allis-Chalmers
Arma Corporation
Arrow-Hart & Hegeman
Atlas Valve Co.
Autocall Co.
Automatic Switch Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bristol Co.
(Cont'd)

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by AUTOFLIGHT
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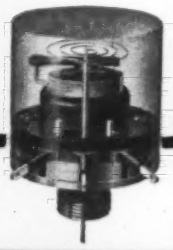
Solve remote control and remote indicating problems by adapting Microtorque Potentiometers to your particular needs. Microtorque Potentiometers can be connected directly to your present gages and indicators by a simple yoke adaptation to the instrument pointer, and used to operate directly recorder controllers, oscillographs, telemetering circuits, etc.

Input torque less than .003 oz. in. Size 1"x1¼" Weight less than ¾ oz.



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A Division of G. M. Giannini & Co., Inc.
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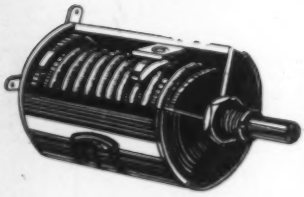

MULTIPOT
PRECISION TEN TURN POTENTIOMETER RHEOSTAT

Adjustable to Within One or Two Hundredths of One Percent, Effecting a Desirable Combination of Fine Adjustment with Long Range in One Compact Instrument

CHECK THESE QUALITY FEATURES

Mechanically smooth and electrically quiet · Any desired number of turns, from 3 to 10 · Available in a wide range of resistance values · Linearity tolerance within .05% or .1% if desired · Torque only 2 ounce inches or less · Simple rugged construction assuring long life, stability of linearity and resistance, and trouble free service · Dependable delivery promises. Quick delivery on most types. 30 day replacement guarantee · Economy. Compare prices of similar potentiometers.

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REMOTE CONTROL EQUIPMENT (Cont'd)
Brooke Eng. Co.
Brown Inst. Co.
Builders Providence
Clare & Co.
Conoflow Corp.
Control Corp.
Cutler-Hammer, Inc.
Davis Reg. Co.
Eastern Industries
Eclipse-Pioneer Div.
Electrimatic Corp.
Electronic Associates
Electronic Lab.
Federal Telegraph Co.
Fischer & Porter
Fisher-Pierce Co.
Foxboro Co.
General Controls
General Elec. Co.
Globe Industries
Guardian Electric
Hagan Corp.
Hammel-Dahl Co.
Hart Mfg. Co.
Hays Corp.
H-B Electric
Illinois Eng. Co.
Infilco, Inc.
Kollsman Inst. Co.
Kurman Electric Co.
Landis & Gyr
Leeds & Northrup
Leupold & Stevens
Martin-Hubbard Corp.
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
Perfex Corp.
Powers Regulator Co.
Radio Receptor Co.
Republic Flow Meters
Robinette Co., W. C.
Schade Valve Mfg. Co.
Scientific Inst. Co.
Seely Inst. Co., Inc.
Shallcross Controls
Sorensen & Co.
Tagliabue Div.
Taylor Inst. Cos.
Thordarson Elec. Mfg.
Wallace & Tiernan
Ward Leonard Elec. Co.
Westinghouse Elec.
Wheelco Instruments
Wilson & Co.
Yardeny Engineering Co.
Zenith Electric Co.

REMOTE - METERING EQUIPMENT, ELECTRICAL
American Temp. Ind.
Anderson Co.
Autoflight Insts. Div.
Automatic Temp. Control
Bristol Co.
Brooks Rotameter
Brown Inst. Co.
Builders-Providence
Clarke Inst. Corp.
Control Corp.
Elec. Tachometer Corp.
Electronic Associates
Esterline-Angus Co.
Farnsworth Television
Fischer & Porter
Foxboro Co.
General Elec. Co.
W. & L. E. Gurley
Hagan Corp.
Hathaway Inst. Co.
Hays Corp.
H & H Thermostats
Kellogg Switchboard
Kollsman Inst. Div.
Kurman Electric Co.
L. A. B. Corp.
Landis & Gyr
Leeds & Northrup Co.
Martin-Hubbard Corp.
Mason-Neilan Regulator
Moisture Register Co.
Moore Products
Panoramic Radio Co.
Pioneer Instrument
Polarad Electronics
Republic Flow Meters
Schaevitz Eng.
Sherron Metallic
Statham Labs.
Tagliabue Div.
Westinghouse Elec.
Wilson & Co.
Yardeny Engineering

REMOTE - METERING EQUIPMENT, HYDRAULIC
Automatic Temp. Control
Builders-Providence
Infilco, Inc.
Leupold & Stevens
Smith Meter Co.
Westinghouse Elec.

REMOTE - METERING EQUIPMENT, PNEUMATIC
American Meter Co.
Automatic Temp. Control
Bristol Co.
Brooks Rotameter
Brown Inst. Co.
Builders-Providence
Conoflow Corp.
Fischer & Porter
Foxboro Co.
Hagan Corp.
Haydon Co., A. W.
Mason-Neilan Regulator
Moore Products
Republic Flow Meters
Taylor Inst. Cos.

RESISTANCE LOADING EQUIPMENT
De Jur-Amsco
Eastern Specialty Co.

RESISTANCE LOADING EQUIPMENT (Cont'd)
General Elec. Co.
Hardwick, Hindle, Inc.
International Resistance
Precision Resistor Co.
Shallcross Mfg.
Ward Leonard

RESISTANCES
Aerovox Corp.
Allen-Bradley Co.
Associated Research
Autoflight Insts. Div.
Automatic Elec.
Beck Bros.
Central Scientific Co.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
Electronic Dev. Lab.
General Elec. Co
General Radio Co.
Gray Instrument
Instrument Resistors
International Resistance
Leeds & Northrup
Madison Elec. Prod. Div.
Mallory & Co.
Ohmite Mfg. Co.
Precision Resistor Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Van Dyke Instruments
Ward Leonard
Westinghouse Elec.

RESISTORS, Adjustable
Aerovox Corp.
Allen-Bradley Co
Autoflight Insts. Div.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
De Jur-Amsco
General Radio Co.
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
Leetrohm Inc
Leeds & Northrup
Mallory & Co.
Model Engineering
Ohmite Mfg. Co.
Resistors, Inc.
Sticht Co.
Van Dyke Instrument
Walker-Jimieson, Inc.
Ward Leonard Electric Co.
Westinghouse Elec.

RESISTORS, Carbon Compression
Allen-Bradley Co.
Beck Bros.
Eastern Specialty Co.
Eclipse-Pioneer Div.
Jas. G. Biddle Co.
International Resistance
Keystone Carbon
Natl. Carbon Co., Inc.
Ohio Carbon Co.
Speer Carbon Co.
Welch Mfg. Co.

RESISTORS, High Frequency
Beck Bros.
Clarke Inst. Corp.
Corning Glass Works
Daven Co.
Erie Resistor Corp.
General Elec. Co.
General Radio Co.
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
Leeds & Northrup Co
Madison Elec. Prod. Div.
Mallory & Co.
Measurements Corp.
Ohmite Mfg. Co.
Resistance Products Co.
Shallcross Mfg. Co.
Ward Leonard Elec. Co.

RESISTORS, High Voltage
Associated Research
Beck Bros.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
General Elec. Co.
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
J B L Instrument Co.
Madison Elec. Prod. Div.
Ohmite Mfg. Co.
Reiner Electronics
Resistance Products Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Electric Co.
Ward Leonard Electric Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RESISTORS, Manganin
Associated Research
Autoflight Insts. Div.
Beck Bros.
Daven Co.
De Jur-Amsco
Electronic Dev. Lab.
Federal Instrument
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors Co.
Leeds & Northrup Co.
Madison Elec. Prod. Div.
Ohmite Mfg. Co.
Radio City Products
Reiner Electronics
Resistance Products Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Triplett Elec. Inst.
Van Dyke Instruments
Westinghouse Elec.

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Offered for remote measurement (any distance) of pressure, flow, temperature, liquid level, motion and gate position, voltage, current power, totalized power load, and reactive volt amperes. Transmission may be over telephone circuits, private wires, or carrier current channels. Also remote automatic control. Bulletin M1700. The Bristol Co., 113 Bristol Road, Waterbury 91, Conn.

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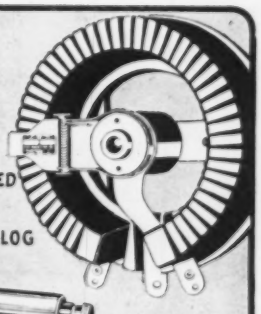
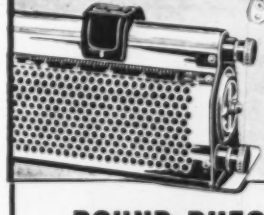
VITREOUS ENAMELED ROUND RHEOSTATS NEW SPRING-HINGED CONTACT ARM WRITE FOR CATALOG





TUBULAR RHEOSTATS & RESISTORS

ROUND RHEOSTATS

7 SIZES: From 50 to 500 WATT

SPRING-HINGED CONTACT ARM for uniform, unchangeable contact pressure. Easy and smooth to operate.

PROTECTED & UNPROTECTED
TUBULAR RHEOSTATS
and
POWER RESISTORS

REX RHEOSTAT CO.
BALDWIN, L. I., N. Y.

RESISTORS, Molded
Aerovox Corp.
Allen-Bradley Co.
Beck Bros.
Clarostat Mfg. Co.
Erie Resistor Corp.
General Electric Co.
Instrument Resistors Co.
International Resistance
Ohmite Mfg. Co.
Radio City Products
Reiner Electronics
Triplett Electrical Inst.
Westinghouse Elec.

RESISTORS, Standard (See Standards, Resistance)

RESISTORS, Variable
Aerovox Corp.
Allen Bradley Co.
Autoflight Insts. Div.
Beck Bros.
Jas. G. Biddle Co.
Centralab Div.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
De Jur-Amsco
Federal Instrument
General Elec. Co.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Helipot Corp.
Instrument Resistors Co.
International Resistance
Lectohm, Inc.
Leeds & Northrup Co.
Mallory & Co.
Ohmite Mfg. Co.
Natl. Elec. Controller
Resistors, Inc.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg.
Sticht Co.
Van Dyke Instruments

RESISTORS, Wire Wound
Aerovox Corp.
Associated Research
Autoflight Insts. Div.
Automatic Elec. Sales
Beck Bros.
Biddle Co., Jas. G.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
De Jur-Amsco
Federal Instrument
General Elec. Co.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
Lectrohm, Inc.
Leeds & Northrup Co.
Madison Elec. Prod. Div.
Mallory & Co.
Model Engineering
National Electric Control
Ohmite Mfg. Co.
Resistance Prod. Co.
Resistors, Inc.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Simpson Electric Co.
Sticht Co.
Triplett Electrical Inst.
Van Dyke Instruments
Ward Leonard Electric Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RHEOSTATS, Battery Charging
Allen-Bradley Co.
Beck Bros.
Centralab Div.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
De Jur-Amsco
Hardwick, Hindle, Inc.
International Resistance
Natl. Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Field
Cutler-Hammer, Inc.
Ohmite Mfg. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Laboratory
Allen-Bradley Co.
American Inst. Co.
Autoflight Insts. Div.
Beck Bros.
Biddle Co., Jas. G.
Centralab Div.
De Jur-Amsco Corp.
Central Scientific Co.
Centralab Div.
Chicago Apparatus Co.
Clarostat Mfg. Co.
Eastern Specialty Co.
Electronic Associates
General Radio Co.
G-M Labs
Gray Instrument Co.
Hardwick, Hindle, Inc.
Mallory & Co.
Natl. Elec. Controller
National Tech. Labs.
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Schaefer Bros. Co.
Sticht Co.
Thwing Albert Inst. Co.
Van Dyke Instruments
Ward-Leonard Elec. Co.

RHEOSTATS, Meter Testing
Allen-Bradley Co.
Beck Bros.
Biddle Co., Jas. G.
Clarostat Mfg. Co.
De Jur-Amsco Corp.
Eastern Specialty Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
International Resistance
Leeds & Northrup
Mallory & Co.
Natl. Elec. Controller
Ohmite Mfg. Co.
Shallcross Mfg.
States Co.
Ward Leonard Elec. Co.

RHEOSTATS, Slide Wire
Beck Bros.
Biddle Co., Jas. G.
Central Scientific Co.
Chicago Apparatus Co.
Cutler-Hammer, Inc.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Helipot Corp.
Leeds & Northrup
Natl. Elec. Controller
National Tech. Labs.
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht Co.
Thwing-Albert Inst. Co.
Van Dyke Instruments
Ward Leonard Elec. Co.
Welch Scientific Co.

RIDEOMETERS, RIDE COMFORT Recorder & Riding-Quality Instruments
Commercial Research
Impact Register Co.
Jaeger Watch Co.
Sperry Products, Inc.
Waugh Laboratories

ROTAMETERS (See Flowmeters, Area, Free Float Type)

RULES, Adjustable Curve (See Drawing Instruments)

RULES, Aluminum
Grammes & Sons
Keuffel & Esser Co.
Lufkin Rule Co.
Warren-Knight Co.

RULES, Brass
Bliss & Co.
Grammes & Sons
Lufkin Rule Co.
Mico Instrument Co.
Starrett Co.
Warren-Knight Co.

RULES, Caliper
American Measuring Inst.
Brown & Sharpe
Glogau & Co.
Lufkin Rule Co.
Millers Falls Co.
Starrett Co.
Union Tool Co.
Warren-Knight Co.

RULES, Drafting Room (See Drawing Instruments)

RULES, Folding
Bliss & Co.
Dietzgen Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Starret Co.
Warren-Knight Co.
Weber Co.

RULES, Glass
Fish-Schurman Co.
Dusenberry Co.
Glass Engraving Co.
Lufkin Rule Co.
Mico Instrument Co.
Phoenix Prec. Inst.
Scientific Glass App.

RULES, Parallel
American Meas. Insts.
Bliss & Co.
Dietzgen Co.
Hamilton Mfg. Co.
Keuffel & Esser Co.
Negus, T. S. & J. D.
Speidel & Co
Warren-Knight Co.
White Co., Inc.
Weber Co.

RULES, Precision Standard
Amer. Measuring Insts.
Brown & Sharpe
Gaertner Scientific Corp.
Lufkin Rule Co.
Starrett Co.

RULES Shrinkage
Brown & Sharpe
Keuffel & Esser Co.
Lufkin Rule Co.
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Slide (See Drawing Instruments)

RULES, Slide, Psychrometric
Fries & Sons

RULES, Steel
American Measuring Insts.
Brown & Sharpe
Grammes & Sons
Keuffel & Esser Co.
Lufkin Rule Co.
(Cont'd)

RULES, Steel (Cont'd)
Mico Instrument Co.
Millers Falls Co.
Scherr Co., Inc.
Speidel & Co.
Starrett Co.
Union Tool Co.
Warren-Knight Co.
Weber Co.

RULES, Wood
Henschel & Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Warren-Knight Co.
Weber Co.

RUNNING TIME RECORDERS
American Time Prod.
Bristol Co.
Cincinnati Time Rec.
Marion Electrical Inst.
Westinghouse Elec.

RUNNING TIME TOTALIZERS
Bristol Co.
Cincinnati Time Rec.
Cramer Co., Inc.
Elec. Tachometer Corp.
Gorrell & Gorrell
Haydon Co., A. W.
Jaeger Watch Co.
Production Instrument
Serdex, Inc.
Standard Elec. Time

SACCHARIMETERS
Bausch & Lomb Opt.
Central Scientific Co.
Jerrell-Ash Co.
Kimble Glass
Moeller Instrument Co.
Ricker Inst. Co.
Rudolph & Sons.
Sargent & Co.
Trerice Co.
Weksler Thermometer

SACCHAROMETERS
Central Scientific Co.
Fleischhauer & Son
Griebel Co.
G. M. Mfg. Co., Inc.
H. B. Inst. Co.
Kimble Glass Co
Moeller Instrument Co.
Precision Therm. & Inst.
Rascher & Betzold
Rieker Inst. Co.
Ruehfel Co.
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst. Cos.
Testrite Instrument Co.
Trerice Co.
Wagner & Son
Weksler Thermometer

SALINITY INDICATORS
Bendix Marine Products
Central Scientific Co.
Engineering Labs., Inc.
Fleischhauer & Son
G. M. Mfg. Co., Inc.
H-B Inst. Co.
Industrial Insts., Inc.
Instrument Lab., nc.I
Leeds & Northrup Co.
McNab of Bridgeport
Moeller Inst. Co.
Precision Therm. & Inst.
Rascher & Betzold
Rubicon Co.
Ruehfel Co.
Schultheis Corp.
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst. Cos.
Thwing Albert Inst. Co.
Trerice Co.
Weksler Thermometer
Wagner & Son
Westinghouse Elec.

SALINOMETERS (See Salinity Indicators)

SAMPLER, Boiler Water
Hagan Corp.
Natl. Aluminate Corp.
Tagliabue Div.

SAMPLERS, Oil
Braun Corp.
Central Scientific Co.
Johnston & Jennings Co.
Precision Scientific
Proportioneers, Inc.
Refinery Supply Co.
Scientific Glass Apparatus
Tagliabue Div.

SAMPLERS, Oil Bottomhole
Precision Scientific
Ruska Inst. Corp.

SAMPLERS, Sewage
Builders-Providence
Central Scientific Co.
Infilco, Inc.
Precision Scientific
Scientific Glass Apparatus
Thwing-Albert Inst.

SAMPLERS, Silt
Central Scientific Co.
Leupold & Stevens

SCALES (See also object of Measurement and Control

SCALES, Antimony Test
Howe Scale Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Automatic
Automatic Scale Co.
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Porter, George K.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.
Triner Sales Co.

SCALES, Bag Filling
Automatic Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Jacobs Bros. Co.
Richardson Scale Co.
Toledo Scale Co.

SCALES, Basis Weight
Amthor Testing Inst. Co.
Becker, Inc., Christian
Buffalo Scale Co.
Exact Scale Co.
Howe Scale Co.
Seederer-Kohlbusch
Testing Machines, Inc.
Thwing-Albert Instrument
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Bulk Weighing
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Conoflow Corp.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Jacobs Bros. Co.
Merrick Scale Mfg.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Cement Batching
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.
Triner Sales Co.

SCALES, Checking
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Classifying
Chatillon & Sons
Exact Weight Scale Co.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Toledo Scale Co.
Triner Sales Co.

SCALES Computing
Amthor Testing Inst.
Exact Weight Scale
International Bus. Mach.
Jacobs Bros., Inc.
Toledo Scale Co.
Triner Sales Co.

SCALES, Continuous Weighing
Buffalo Scale Co.
Builders-Providence
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Jacobs Bros. Co.
Jeffrey Mfg. Co.
Merrick Scale Mfg. Co.
Omega Machine
Porter, George K.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.
Triangle Package Mach.

SCALES, Conveyor
Builders-Providence
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Merrick Scale Mfg. Co.
Omega Machine
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Counting
Amthor Testing Inst. Co.
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Potter Instrument
Seederer-Kohlbusch
Toledo Scale Co.
Triner Sales Co.

SCALES, Crane
Baldwin Locomotive
Buffalo Scale Co.
Chatillon & Sons
Fairbanks, Morse & Co.
Howe Scale Co.

SCALES, Dairy
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.
Troemner, Henry

SCALES, Differential
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Jacobs Bros. Co., Inc.
Thwing-Albert Instrument

SCALES, Drawing (See Drawing Instruments)

SCALES, Dump
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Toledo Scale Co.

SCALES, Dynamometer
Baldwin Locomotive
Central Scientific Co.
Chatillon & Sons
Conoflow Corp.
Dillon & Co.
Exact Weight Scale
Fairbanks, Morse & Co.
Hagan Corp.
Howe Scale Co.
Porter, George K.
Republic Flow Meters
Seederer-Kohlbusch, Inc.
Stoelting Co., C. N.
Toledo Scale Co.

SCALES, Estimating
Exact Weight Scale Co.
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Grain & Seed Testing
Amthor Testing Inst. Co.
Automatic Scale Co.
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Cuthbert Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Fisher Scientific Co.
Gump Co.
Howe Scale Co.
Jacobs Bros. Co.
Newark Scale Works
Richardson Scale Co.
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Hopper
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Jacobs Bros. Co.
Richardson Scale Co.
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Laboratory
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Chicago Apparatus Co.
Clay-Adams Co.
Dietert Co.
Eberbach & Son
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Fisher Scientific Co.
Goetze Niemer Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co.
Microchemical Service
Newark Scale Works
Seedburo Equipment
Seederer-Kohlbusch, Inc.
Suter, Alfred
Thompson Balance
Toledo Scale Co.
Torsion Balance Co.
Troemner, Henry
Voland & Sons

SCALES, Larry Car
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, L[illegible]
Exact We[illegible] Scale Co.
Jacobs Br[illegible] Co., Inc.
Merrick S[illegible] Mfg.
Richardson[illegible]le Co.
Toledo Sca[illegible]

SCALES, L[illegible] of Weight
Becker, In[illegible] hristian
Buffalo Sc[illegible] Co.
Builders-P[illegible]dence
Dietert Co.
Exact Weig[illegible] Scale Co.
Jacobs Bros[illegible]
Omega Mac[illegible]
Proportione[illegible] Inc.
Seederer-K[illegible]usch, Inc.
Streeter-Am[illegible] Co.
Thwing-Alb[illegible] Inst.
Toledo Scal[illegible]
Torsion Bala[illegible] Co.

SCALES, Mea[illegible]ring
American M[illegible] Insts.
Automatic S[illegible] Co.
Dietzgen Co.
Eitzen Co.
Howe Scale [illegible]
Porter, Geor[illegible] K.
Richardson S[illegible] Co.
Triner Sales [illegible]

SCALES, Mud
Chatillon & Sons

SCALES, Over & Under
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Moisture Register Co.
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.
Troemner, Henry

SCALES, Packaging
Automatic Scale Co.
Becker, Inc., Christian
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Richardson Scale Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Platform
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

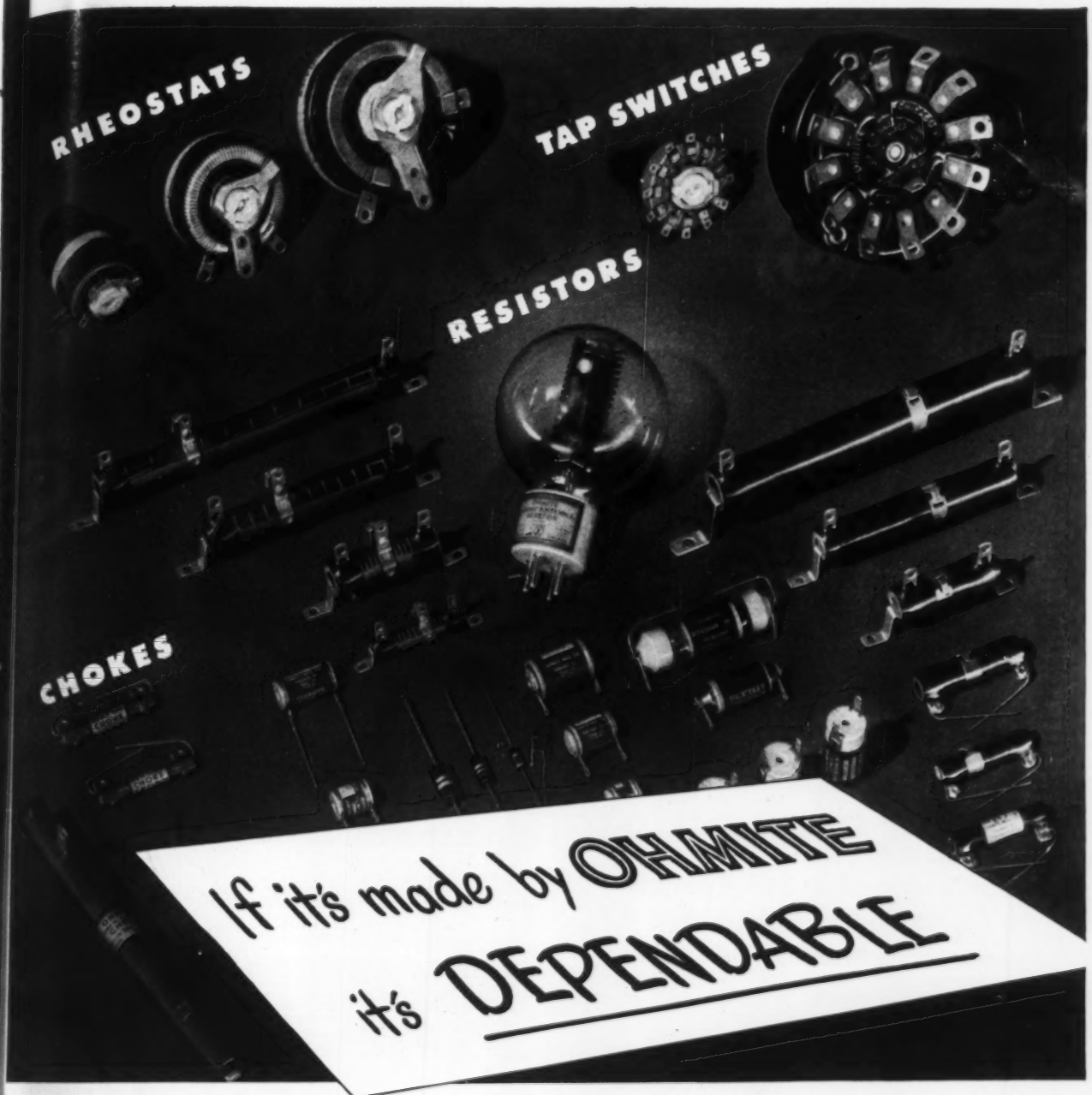
SCALES, Portable
Black & Decker
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Kron Co.
Richardson Scale Co.
Toledo Scale Co.
Triner Sales Co.
Voland & Sons

SCALES, Predetermined Weight
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Schaffer Poidometer Co.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Recording
Buffalo Scale Co.
Fairbanks, Morse & Co.
Hagan Corp.
Howe Scale Co.
Merrick Scale Mfg. Co.
Porter, George K.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.
Wallace & Tiernan

SCALES, Remote Indicating
Conoflow Corp.
Exact Weight Scale
Merrick Scale Mfg.
Porter, George K.
Republic Flow Meters
Toledo Scale Co.

SCALES, Rolling Mill
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Streeter-Amet Co.
Toledo Scale Co.



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Exact Weight Scale
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Steel
American Meas. Insts.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
Lufkin Rule Co.
Streeter-Amet Co.
Toledo Scale Co.

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Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Eberbach & Sons
Exact Weight Scale
Gump Co.
Howe Scale Co.
Humboldt Mfg. Co.
Jacobs Bros. Co.
Newark Scale Works
Toledo Scale Co.
Torsion Balance Co.

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Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Suter, Alfred
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Track
Baldwin Locomotive
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Truck
Black & Decker
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Water Meter
Alteneder & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Jacobs Bros. Co.
Toledo Scale Co.

SCALES, Yardage
Amthor Testing Inst.
Brown & Sharpe
Buffalo Scale Co.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Kron Co.
Toledo Scale Co.

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Fecker, Inc.

SCREENS, X-Ray Fluoroscopic
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General Electric X-Ray
General Luminescent
Goetze-Niemer Co.
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Patterson Screen Div.
Stoelting Co., C. H.
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Bastian-Blessing
Beck Co.
Belfield Co.
Betts & Betts
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cutler-Hammer, Inc.
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Dickson Co.
Elec. Indicator Corp.
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Fisher-Pierce Co.
Foxboro Co.
Kiely & Mueller
Lammert & Mann Co.
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Minneapolis-Honeywell
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Penn Electric Switch Co.
Perfex Corp.
Ruggles-Klingemann
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Scientific Inst. Co.
Seely Inst. Co.
Shallcross Controls
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
United Transformer
Wheelco Instruments

SERVO-MOTORS, Electric Motor
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Avion Instrument
Barber-Colman
Beck Co.
Brown Inst. Co.
Collins Radio
Eclipse-Pioneer Div.
Electric Indicator
Electronic Associates
Fairchild Camera
General Elec. Co.
General Regulator Corp.
L. A. B. Corp.
Lear, Inc.
Martin-Hubbard Corp.
Minneapolis-Honeywell
Robinette Co., W. C.
Shwien Engg.
Shallcross Controls
Sperry Gyroscope Co.
Wilson & Co.

SERVO-MOTORS, Electric Solenoid
Brown Inst. Co.
Martin-Hubbard Corp.
Ruggles-Klingemann
Shallcross Controls

SERVO-MOTORS, Hydraulic
Askania Regulator Co.
Autoflight Insts. Div.
Bailey Meter Co.
Cash Co.
General Regulator Corp.
Hagan Corp.
Martin-Hubbard Corp.
Mason-Neilan Regulator
Republic Flow Meters
Ruggles-Klingemann
Shallcross Controls

SERVO-MOTORS, Mechanical
Avion Instrument
Foxboro Co.
Hagan Corp.
Martin-Hubbard Corp.

SERVO-MOTORS, Pneumatic
Askania Regulator Co.
Bailey Meter Co.
Brown Inst. Co.
Cash Co.
Hagan Corp.
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
Republic Flow Meters

SEXTANTS
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Bausch & Lomb Opt.
Dusenbery Co.
Eclipse-Pioneer Div.
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Keuffel & Esser Co.
Kuner Co., Max
Leupold & Stevens
Link Aviation Devices
Negus, T. S. & J. D.
Pioneer Instrument Co.
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Warren-Knight Co.
White Co., Inc.

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Kenyon Instrument Co.
Negus, T. S. & J. D.
Pitometer Log Corp.

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Burton-Rogers Co.
Columbia Elec. Mfg.
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SHUNTS (Cont'd)
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Electronic Dev. Lab.
Esterline-Angus Co.
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Hickok Elec. Inst. Co.
Instrument Resistors, Inc.
International Resistance
Lewis Engineering
Madison Elec. Prod. Div.
Norton Electrical Inst.
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Rawson Electrical Inst.
Reiner Electronics
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg.
Standard Science Sup.
Simpson Electric Co.
Sun Manufacturing
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

SHUNTS, Standard
Associated Research
Cambridge Instrument Co.
De Jur-Amsco
Electronic Dev. Lab.
Esterline-Angus Co.
General Electric Co.
Gray Instrument Co.
Hickok Electrical Inst.
Instrument Resistors Co.
International Resistance
Leeds & Northrup Co.
Lewis Engineering
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg.
Triplett Elec. Inst. Co.
Weston Elec. Inst. Corp.

SIEVE SHAKERS
American Inst. Co.
Braun Corp.
Central Scientific
Dietert Co.
Humboldt Mfg. Co.
Newark Wire Cloth
Precision Scientific

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Central Scientific Co.
Dietert Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Newark Wire Cloth
Precision Scientific Co.
Riehle Division
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Moore Products

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G-M Labs.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

SIGHTS, GUN, Telescopic
Bausch & Lomb Opt.
Bell & Howell Co.
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Fecker, Inc.
Kollmorgan Optical Co.
Leupold & Stevens
Palos Optical Co.
Perkin-Elmer Corp.
Plummer & Kershaw
Unertl Optical Co.
Zeiss, Inc., Carl

SIGNAL GENERATORS (See Generators, Signal)

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Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Temp. Controls
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Betts & Betts
Browning Labs.
Bullard Co.
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Eastern Industries
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Fischer & Porter
Foxboro Co.
General Elec. Co.
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Haydon Co., A. W.
Holtzer-Cabot Elec. Co.
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(Cont'd)

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Leupold & Stevens
Lumenite Co.
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National Time & Signal
Panellit, Inc.
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Am. Gas Accumulator
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Weston Elec. Inst. Corp.
Worner Electronics

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Kuner Co., Max
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Bland & Sons
Kenyon Instrument Co.
Kuner Co., Max
Moeller Instrument Co.
Negus, T. S. & J. D.

SOUNDING TUBES
Ballauf Mfg. Co.
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Leupold & Stevens
Moeller Instrument Co.
Negus, T. S. & J. D

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Hagan Corp.
Hays Corp.
Leeds & Northrup
Moeller Inst. Co.
Moore Products
Poole Mfg. Eng.
Precision Scientific
Refinery Supply
Republic Flow Meters
Ruehfel Co.
Schultheis Corp.
Schutte & Koerting
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Wallace & Tiernan

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Central Scientific Co.
Eastern Science Co.
Fuess, Inc.
Gaertner Scientific Corp.

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Bryden Co.
Fecker, Inc.
Gaertner Scientific Corp.
Henson Co., Fred C.
Jarrell-Ash
Spencer Lens Co.
Zeiss, Inc., Carl

SPECTROGRAPHS, Diffraction Grating
Applied Research Labs.
Baird Associates
Central Scientific
Dearborn Scientific
Dietert Co.
Jarrell-Ash Co.

SPECTROGRAPHS, Mass
Berkeley Scientific

SPECTROGRAPHS, Oscillating
General Elec. Co.
Hayes Scientific App

SPECTROGRAPHS, Raman
Ray Control Div.

SPECTROGRAPHS, Vacuum
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Central Scientific Co. C
Dietert Co.
Fecker, J. W.
Fuess, Inc.
Jarrell-Ash Co.
Ray Control Div.
Thomas Co., Arthur H.

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Fuess, Inc.
Gaertner Scientific
General Electrical X-Ray
Hayes Scientific App.
Henson Co., Fred C.
Jarrell-Ash Co.
Kelley-Koett Mfg.
North Amer. Philips
Victoreen Instrument Co.
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Bausch & Lomb Optical
Consolidated Engg.
Dearborn Scientific
Fuess, Inc.
Gaertner Scientific
Jarrell-Ash Co.
Martin-Hubbard Corp.
National Tech. Labs.
Rudolph & Sons
Welch Scientific

SPECTROMETERS, Recording Mass
Berkeley Scientific
Consolidated Engg.
General Elec. Co.

SPECTROMETERS, Infra-Red
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Gaertner Scientific Corp.
General Elec. Co.
Jarrell-Ash Co.
National Tech. Labs.
Perkin-Elmer Corp.
Pfaltz & Bauer
Phoenix Prec. Inst.

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SPECTRO-PHOTOMETERS (See Photometers, Spectro)

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American Optical
Bausch & Lomb Opt.
Dearborn Scientific
Fecker, Inc.
Fish-Schurman Corp.
Fuess, Inc.
General Elect. X-Ray
Gaertner Scientific Corp.
Jarrell-Ash Co.
Laboratory Specialties
Leitz, Inc.
Rudolph & Sons
Spencer Lens Co.
Welch Scientific

SPECTROSCOPE, Quartz
Gaertner Scientific Corp.

SPECTROSCOPES, Stellar
Am. Telescope Labs.
Central Scientific Co.
Eastern Scientific Co.
Fecker, Inc.
Mico Instrument Co.
Perkins-Elmer Corp.
Zeiss, Inc., Carl

SPECTRUM TUBES
Central Scientific Co.
Fuess, Inc.
Gaertner Scientific Corp.
General Physical Lab.
Jarrell-Ash Co.

SPEED, Indicators
Amthor Testing Inst. Co.
Anderson Co.
Associated Research
Automatic Elec. Sales
Bailey Meter Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Bristol Co.
Brown Inst. Co.
Brown & Sharpe
Chicago Elec. Tachometer
Cincinnati Time Rec.
Commercial Research
Cramer & Co., Inc.
Electric-Speed Ind. Co.
Elec. Tachometer Corp.
Elgin National Watch
Esterline-Angus Co.
Foxboro Co.
Gaertner Scientific Corp.
General Elec. Co.
General Radio
Hasler-Tel. Co.
Hastings Inst. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Jaeger Watch Co.
Jones-Motrola
Leeds & Northrup Co.
Manning, Maxwell, Moore
McDonnell Odometer Co.
Metron Instrument Co.
Moisture Register Co.
Pioneer Instrument
Potter Instrument
Precision Therm.
Reliance Elect.
Roller-Smith Co.
Sangamo Electric Co.
Scherr Co., Inc.
Standard Elec. Time
Starrett Co.
Sticht Co.
Triplett Elec. Inst.
U. S. Taximeter
Valve Pilot Corp.
(Locomotive)
Veeder-Root, Inc.
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zernickow Co., O.

SPEED, Recorders (See Speed Indicators)

SPEED, Regulators (See Controllers, Automatic, Tachometric)

SPEED SYNCHRONIZING INDICATORS
Electric Speed Ind. Co.
Electric Tachometer
General Elec. Co.
Westberg Mfg. Co.

SPEEDOMETERS
Boulin Instrument Corp.
Central Scientific Co.
Commercial Research
Corbin Screw Corp.
Cramer & Co., Inc.
Electric Auto-Lite
Elec. Tachometer Corp.
Electronic Associates
General Elec. Co.
Jones-Motrola
Stewart-Warner Corp.
Westinghouse Elec.
American Askania Corp.
Central Scientific Co.
Ferner Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Merkle Korff Gear
Metron Instrument
Seisi Co., Inc.
Standard Electric Time
U. S. Taximeter
Waltham Watch Co.
Welch Scientific Co.
Westberg Mfg. Co.

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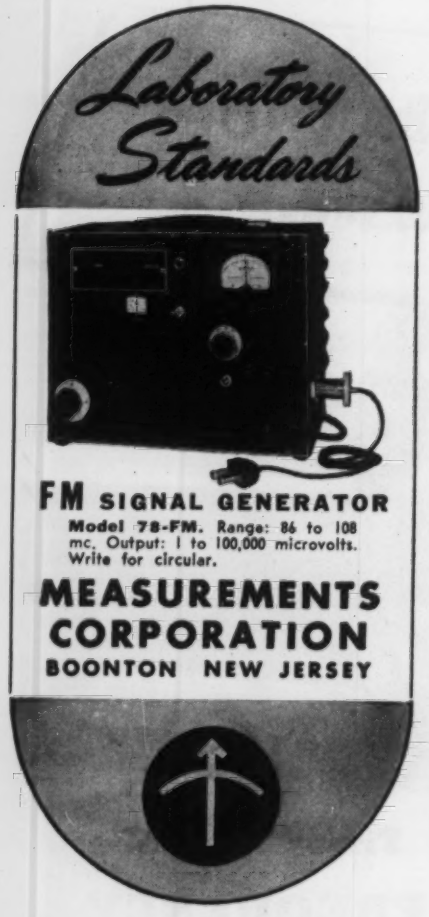
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DoAll Co.
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Jansson Gage Co.
Mico Instrument Co.
Millers Falls
Starrett Co.
Thomas Tool
Union Tool Co.
Vinco Corp.
Warren-Knight Co.

STANDARD CELLS (See Cells, Standard)

STANDARDS, Acoustic
Massa Laboratories

STANDARDS, Capacitance
Aerovox Corp.
Cambridge Inst. Co.
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.
Rubicon Co.
Solar Mfg. Corp.

STANDARDS, Color
Fish-Schurman Co.
Hellige, Inc.
Munsell Color Co.
Tagliabue Div.

STANDARDS, E.m.f.
Cambridge Inst. Co.
Espey & Northrup Co.
Gray Instrument
Rubicon Co.

STANDARDS, Frequency
American Inst. Co.
American Time Prods.
Crystal Research Labs.
Espey Mfg.
Ferris Inst. Corp.
General Radio Co.
Gibbs & Co.
Hewlett-Packard Co.
MacLeod & Hanopol
Millen Mfg. Co.
Potter Instrument
RCA Div.
Sherron Metallic
Telechron, Inc.
Times Facsimile Corp.
Western Electric

STANDARDS, Inductance
Cambridge Inst. Co.
General Radio Co.
Leeds & Northrup Co.
Rubicon Co.

STANDARDS, Length
Acme Industrial
Gaertner Scientific Corp.
Gurley, W. & L. E.
Size Control Co.
Van Keuren Co.

STANDARDS, Mass
Gurley, W. & L. E.
Seederer-Kohlbusch, Inc.

STANDARDS, Potential
Leeds & Northrup Co.
Rubicon Co.
Sensitive Research Inst.

STANDARDS, Pressure
Green, Henry J.
Precision Therm.

STANDARDS, Resistance
Associated Research
Beck Bros.
Cambridge Inst. Co.
Cutler-Hammer, Inc.
Federal Instrument
General Radio Co.
Gray Instrument
Hardwick, Hindle, Inc.
Industrial Insts., Inc.
Instruments Resistors Co.
International Resistance
Leeds & Northrup Co.
Resistance Products Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sticht & Co.
Victoreen Instrument Co.
Ward Leonard Elec. Co.
General Radio Co.
Massa Labs.
RCA Div.
Western Electric

STANDARDS, Surface Roughness
Baird Associates
Surface Checking Gage

STANDARDS, Temperature
Green, Henry J.
Leeds & Northrup Co.
Moeller Instrument Co.
Precision Therm.
Revere Co.
Tagliabue Div.

STANDARDS, Time
American Inst. Co.
American Time Prods.
Gaertner Scientific Corp.
General Radio Co.
Gibbs & Co.
Standard Elec. Time Co.
Stoelting Co., C. H.
Varo Mfg. Co.
Warren Telechron Co.

STANDARDS, Volume
Gurley, W. & L. E.

STARTERS, MOTOR
Allen-Bradley Co.
Allis-Chalmers
Arrow-Hart & Hegeman
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Cutler-Hammer, Inc.
Eclipse Aviation
Federal Telegraph Co.
General Elec. Co.
Master Electric
Monitor-Controller Co.
Penn Electric Switch Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

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American Meter Co.
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Elec. Indicator Corp.
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STEAM METERS (See Flow Meters, Steam)

STEEL TAPES (See Tapes, Steel)

STELLAR SPECTROSCOPES (See Spectroscopes, Stellar)

STEREOSCOPES
Abrams Instrument

STEREOSCOPES, X-RAY
Abrams Instrument
Bausch & Lomb Optical
Fairchild Camera
Kelley-Koett Mfg. Co.
Westinghouse X-Ray Co.

STETHOSCOPES, ENGINEERS
Brush Development Co.
Fairchild Camera
Gilmore, E. R.
Test-A-Tone Co.

STIFFNESS TESTERS, PAPER (See Tester, Stiffness, Paper)

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Central Scientific Co.
Electric Hotpack Co.
Fish-Schurman Co.
Goetze Niemer
Precision Scientific
Specialty Glass Co.
Stokes Machine Co.
Weber Bros. Metal Works

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Central Scientific
Eastern Engg. Co.
Eberbach & Son
Fish-Schurman Corp.
Fisher-Scientific
Palo-Myers, Inc.
Precision Scientific
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Sneidel & Co.
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Weber Co., F.
White Co., Inc.

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Penn Ind. Inst. Corp.
Robinson Orifice Fitting
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STRAIN TESTERS, GLASS (See Testers, Strain (Glass))

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Gurley, W. & L. E.
Hathaway Instrument
Keuffel & Esser Co.
Leupold & Stevens
Martin-Hubbard Corp.

STOP WATCHES (See Watches, Stop)

STRESS INDICATORS
Ames Co., B. C.
Bailey Meter Co.
Baldwin Locomotive
Cambridge Inst. Co.
Consolidated Engg.
Federal Products Corp.
Hathaway Instrument
Magnaflux Corp.
Metron Instrument
Riehle Div.
Statham Labs.

STRESS-STRAIN, Indicators
Ames Co., B. C.
Bailey Meter Co.
Baldwin Locomotive
Brush Development
Chatillon & Sons
Consolidated Engg.
(Cont'd)

STRESS-STRAIN Indicators (Cont'd)
Hathaway Instrument
Magnaflux Corp.
Metron Instruments
Nosker Eng. Prod.
Statham Labs.
Trimount Inst. Co.

STRESS-STRAIN, Recorders
Bailey Meter Co.
Baldwin Locomotive
Brush Development
Cambridge Inst. Co.
Century Geophysical
Consolidated Engg.
Hathaway Instrument
Metron Instruments
Nosker Eng. Prod.
Olsen Testing Machine
Riehle Div.
Statham Labs.
Trimount Inst. Co.

STROBOSCOPES
Boulin Inst. Corp.
Commercial Research
Communication Meas. Lab.
Edelmann & Co.
Electric Eye Equip.
Electronic Engineers
General Radio Co.
Knickerbocker Dev.
Pioneer Instrument
Sylvania Elec. Prod.
Welch Mfg. Co.
Westinghouse Elec.
Zeiss, Inc., Carl

SULPHUR BOMBS (See Bombs, Sulphur)

SULPHUR DIOXIDE, Indicators (See Gas Analyzers, Sulphur Dioxide) Recorders (See Gas Analyzers, Sulphur Dioxide)

SUN COMPASS
Abrams Instrument
Dusenbery Co.
Geophysical Inst. Co.

SUNSHINE, Indicators & Recorders
Cambridge Inst. Co.
Esterline-Angus Co.
Friez Instrument
Fuess, Inc.
General Electric Co.
G. M. Mfg. Co., Inc.
Leeds & Northrp
Taylor Inst. Cos.
White Co., Inc.

SUPERVISORY CONTROL EQUIPMENT
Autocall Co.
Automatic Elec. Sales
Bristol Co.
Builders Providence
Control Corp
Cramer & Co., Inc.
General Elec. Co.
Guardian Elec. Mfg. Co.
Leeds & Northrup Co.
Tagliabue Div.
Westinghouse Elec.

SURFACE FINISH COMPARATORS (See Comparators, Surface Finish)

SURFACE FINISH STANDARDS
Brush Development
Pipe Machinery Co.
Surface Checking Gage

SURFACE FINISH TESTERS
Baird Associates
Brush Development Co.
Buehler, Adolph I.
Comtor Co.
General Elec. Co.
Physicists Research
Surface Checking Gage
Swedish Gage
Taber Inst. Corp.
Wilder, R. S.

SURFACE GAGES (See Gages, Surface)

SURFACE PLATES, GLASS
Bausch & Lomb Optical
Binswanger & Co.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Geophysical Inst. Co.
Mogey & Sons
Zeiss, Inc., Carl

SURFACE PLATES, STONE
Herman Stone Co.

SURGE CREST AMMETERS (Ammeters, Surge-Crest)

SURGE, Indicators & Recorders
Cook Electric
Elec. Indicator Corp.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr
Taylor Inst. Co.

SURVEYING INSTRUMENTS
Abrams Instrument
Alpha Instrument Co.
Beckman Co., L.
Berger & Sons
Bliss & Co.
Bostrom-Brady
Bray Optical Co.
Bruning Co., Inc.
Dietzgen Co.
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SURVEYING INSTRUMENTS (Cont'd)
Ferner Co.
Geier & Bluhm
Goidak Co.
Gurley, W. & L. E.
Hastings Inst. Co.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kolesch & Company
Leupold & Stevens
Lufkin Rule Co.
Pittsburgh Ins. & Mach.
Post Co., Frederic
Speedometer Electric Co.
Speidel & Co.
Starrett Co.
Suverkrop Instruments
Ulmer Co., J. C.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co., Inc.
Zeiss, Inc., Carl

SURVEYING INSTRUMENTS, Aneroid
Am. Paulin System
Dietzgen Co.
Wallace & Tiernan
Warren-Knight Co.
White Co.

SURVEYING INSTRUMENTS, Underground, for wells or bore holes
H. Cole Co.
Driftmeters, Inc.
Eastman Oil Well
Engineering Labs., Inc.
Geophysical Inst. Co.
Halliburton Oil Well
Helland Research
Sperry-Sun Well Survey
Warren-Knight Co.
White Co.

SURVEYOR'S CHAINS (See Surveying Instruments)

SWITCHES, Air-operated
Automatic Temp. Control
Cook Electric
Cutler-Hammer, Inc.
General Electric Co.
Hobbs Corp.
Johnson Service Co.
Meletron Corp.
Mu-Switch Corp.
Shallcross Mfg. Co.
Tagliabue Div.
Westinghouse Elec.

SWITCHES, Automatic Transfer
Allen-Bradley Co.
Allied Control Co.
Anderson, A. & J. M.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Control Co.
Automatic Electric Sales
Automatic Switch Co.
Automatic Temp. Control
Barber-Colman
Cook Electric
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Federal Telegraph Co.
General Elec. Co.
Hart Mfg. Co.
Haydon Co., A. W.
Lumenite Co.
Monitor Controller Co.
Ward Leonard Elec. Co.
Westinghouse Elec.
Zenith Elec.

SWITCHES, Instrument
Allen-Bradley Co.
Allis-Chalmers
Arrow-Hart & Hegeman
Autocall Co.
Automatic Electric Sales
Automatic Temp. Control
Barber-Colman
Betts & Betts
Centralab Div.
Cook Electric
Daven Co.
Federal Anti-Capacity
Furnas Electric Co.
General Elec. Co.
General Radio Co.
Hart Mfg. Co.
Industrial Insts., Inc.
J-B-L Inst. Co.
J-B-T Instruments
Kellogg Switchboard
Lewis Engineering
Mallory & Co.
McDonnell & Miller
Mercoid Corp.
Meter Devices Co.
Mossman, Inc.
Ohmite Mfg. Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Co.
Shallcross Mfg.
Teleoptic Co.
Thwing-Albert Instrument
Trimount Inst. Co.
Triplett Elec. Inst. Co.
United States Inst. Corp.
Utah Radio Prods.
Westinghouse Elec.
Weston Elec. Inst. Corp.

SWITCHES, Magnetic
Allen-Bradley Co.
Allis-Chalmers
Arrow-Hart & Hegeman
Autocall Co.
Automatic Switch Co.
Automatic Temp. Control
Cook Electric
Cutler-Hammer, Inc.
(Cont'd)

SWITCHES, (Cont'd)
Furnas Elec. Co.
General Elec.
Guardian E. Mfg. Co.
Hart Mfg. C.
Industrial E. Corp.
Monitor Con. Co.
Penn Electri. witch
Perfex Corp.
Struthers Du.
Ward Leona. Elec. Co.
Warrick, C. I.
Westinghouse ec.
Zenith Elec.

SWITCHES, M. ury
Arrow-Hart & egeman
Continental E. Co.
Elec. Switch C.
Frederick Geo.
General Elec.
Gen. Elec. La. Dept.
H-B Instrumen.
McAlear Mfg.
Mercoid Corp.
Minneapolis-H. ywell
Rhodes, Inc.

SWITCHES, Pyrometer
Bristol Co.
Brown Inst. Co.
Daven Co.
Foxboro Co.
J-B-L Instrume.
Leeds & Northrup
Lewis Engg. Co.
Revere Corp.
Rowe Research Lab.
Tagliabue Div.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
United States Inst. Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Instruments

SWITCHES, Relay
Allen-Bradley Co.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Sales
Automatic Switch Co.
Automatic Temp. Control
Betts & Betts
Clare & Co.
Cook Electric Co.
Cutler-Hammer, Inc.
Eclipse Aviation
Friez Instrument
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
H-B Instrument
Industrial Engr. Corp.
Kellogg Switchboard
Mallory & Co.
Meter Devices Co.
Monitor Controller Co.
Penn Electric Switch
Perfex Corp.
Photoswitch, Inc.
Struthers-Dunn
Ward Leonard Elec. Co.
Warrick Co.
Westinghouse Elec.
Zenith Electric Co.

SWITCHES, Rotary
Allen-Bradley Co.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Sales
Barber-Coleman
Bird Electronic
Carter Radio Div.
Centralab Div.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
Federal Telegraph Co.
Foxboro Co.
Furnas Electric Co.
General Control Co.
General Elec. Co.
General Radio Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
J-B-L Instrument
J-B-T Instruments
Leeds & Northrup
Lewis Engg. Co.
Mallory & Co.
Meter Devices Co.
Ohmite Mfg. Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Tagliabue Div.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
United States Inst. Corp.
Utah Radio Prods.
Westinghouse Elec.
Weston Elec. Inst. Corp.

SWITCHES, Selector
Allen-Bradley Co.
Allis-Chalmers
Arrow-Hart & Hegeman
Automatic Elec. Sales
Betts & Betts
Bird Electronic
Carter Radio Div.
Centralab Div.
Cook Electric
Cutler-Hammer, Inc.
Daven Co.
Federal Telegraph Co.
General Elec. Co.
Guardian Electric
H-B Instrument Co.
J-B-L Instrument
Leeds & Northrup
(Cont'd)

SWITCHES, Selector (Cont'd)
Lewis Engineering
Mallory & Co.
Meter Devices Co.
Minute Mfg. Co.
Revere Co.
Shallcross Mfg. Co.
Thwing-Albert Inst. Co.
United States Inst. Corp.
Westinghouse Elec.

SWITCHES, Snap
Acro Electric
Arrow-Hart & Hegeman
Automatic Temp. Control
Betts & Betts
Cutler-Hammer, Inc.
General Control Co.
General Controls
General Elec. Co.
Guardian Electric
Hart Mfg. Co.
Hetherington & Son
Mallory & Co.
McAlear Mfg. Div.
McDonnell & Miller
Minneapolis-Honeywell
Mu-Switch Corp.
Perfex Corp.
Unimax Switch Corp.
Ward Leonard Elec. Co.

SWITCHES, Snap Action
Acro Electric
Allen-Bradley Co.
Arrow-Hart & Hegeman
Automatic Elec. Sales
Barber-Colman
Betts & Betts
Cutler-Hammer, Inc.
General Control Co.
General Controls
General Elec. Co.
Guardian Electric
Hetherington & Son
J-B-L Instrument
Leeds & Northrup
Micro Switch Div.
Mu-Switch Corp.
Ulanet Co., Geo.
Westinghouse Elec.

SWITCHES, Thermostatic
Advance Electric Co.
Allen-Bradley Co.
Barber-Colman
Betts & Betts
Bridgeport Thermo. Co.
Burling Instrument Co.
Cook Electric Co.
Dickson Co.
Edison Electric Controls
Fenwal, Inc.
Fries & Sons
General Controls
Gleason-Avery, Inc.
Guardian Electric
Hart Mfg. Co.
Mercoid Corp.
(Cont'd)

SWITCHES, Thermostatic (Cont'd)
Minneapolis-Honeywell
Mu-Switch Corp.
Penn Electric Switch Co.
Perfex Corp.
Ranco, Inc.
Shallcross Mfg. Co.
Spencer Thermostat Co.
Struthers-Dunn
Tagliabue Div.
Thwing-Albert Inst.
Ulanet Co., George
Unimax Switch Corp.
Ward Leonard Electric Co.

SWITCHES, Time
Allen-Bradley Co.
American Timer Corp.
Anderson, A. & J. M.
Autocall Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Betts & Betts
Cincinnati Time Rec.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.
Edison Electrical Controls
General Control Co.
General Controls
General Elec. Co.
Gray Laboratory
Guardian Elec. Mfg. Co.
Haydon Co., A. W.
Industrial Engr. Corp.
Industrial Timer
International Register Co.
Landis & Gyr, Inc.
Leich Elec. Co.
Lektra Labs., Inc.
Lumenite Co.
Lux Clock Mfg. Co.
Mercoid Corp.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Photoswitch, Inc.
Photovolt Corp.
Richardson-Allen
Rhodes, Inc., M. H.
Sampsel Time Control
Sangamo Electric Co.
States Co.
Stoelting Co., C. H.
Stromberg Time Corp.
Telechron, Inc.
Thomas Clock Co., Seth
Thompson Clock Co.
Tork Clock
Ulanet Co., Geo.
Wadsworth Elec. Mfg. Co.
Walker-Jimieson, Inc.
Walser Automatic Timer
Ward Leonard Elec. Co.
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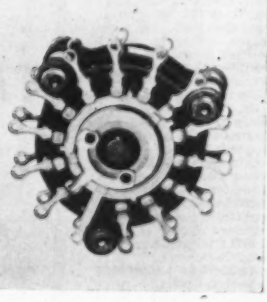
Accurate CORBIN Tachometers

J-B-T

INSTRUMENT TYPE SWITCHES



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SYNCHRONOUS MOTORS (See Motors, Synchronous)

SYNCHROSCOPES
Control Corp.
Eclipse Aviation
Electric Controller
General Elec. Co.
Hickok Elec. Inst. Co.
Kollsman Inst. Co.
Millen Mfg. Co.
Roller-Smith Co.
Triplett Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

TACHOGRAPHS
Amthor Testing Inst.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Cramer & Co., Inc.
Metron Instrument
Sticht Co.
Zeiss, Inc., Carl
Zernickow Co., O.

TACHOMETER TESTERS (See Sesters, Tachometer)

TACHOMETERS, Centrifugal
Amthor Testing Inst. Co.
Associated Research
Barbour Stockwell Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Corbin Screw Corp.
Durant Mfg. Co.
Eclipse-Pioneer Div.
Elec. Tachometer Corp.
Foxboro Co.
General Elec Co.
Hays Corp.
Jones Motrola Sales
Kolisman Inst. Co.
Manning, Maxwell & Moore
Pioneer Instrument Co.
Scherr Co., Inc.
Stewart-Warner Corp.
Sticht Co.
Veeder-Root, Inc.
Viking Instrument Co.
Zernickow Co., O.

TACHOMETERS, Chronometric
Amthor Testing Inst.
Associated Research
Biddle Co., Jas. G.
Boulin Inst. Corp.
Coats Machine Tool Co
(Cont'd)

TACHOMETERS, Chronometric (Cont'd)
Cramer & Co., Inc.
Elec. Tachometer Corp.
Elgin Natl. Watch Co.
Hasler-Tel Co.
Jaeger Watch Co.
Milwaukee Lock & Mfg.
Pierce Watch Co.
Potter Instrument
Scherr Co., Inc.
Standard Elec. Time
Sticht Co.
Zernickow Co., O.

TACHOMETERS, Cross-pendulum
Amthor Testing Inst.
Associated Research
Biddle Co., Jas. G.
Coats Machine Tool Co.
Manning, Maxwell & Moore
Sticht Co.
Zernickow Co., O.

TACHOMETERS, Electric
Airdesign & Fabrication
Anderson Co.
Bailey Meter Co.
Brigham Co.
Bristol Co.
Brown Inst. Co.
Chicago Elec. Tachometer
Clarke Inst. Corp.
Eclipse-Pioneer Div.
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Electro Mechano Co.
Esterline-Angus Co.
Foxboro Co.
General Elec. Co.
Hastings Inst. Co.
Hathaway Inst. Co.
Hays Corp.
Hickok Elec. Inst. Co.
Ideal Industries, Inc.
Instrument Lab. Inc.
Jaeger Watch Co.
J-B-T Instruments
Jones Motrola Sales
Knickerbocker Div.
Kollsman Inst. Co.
Lantz-Phelps Corp.
Martin Decker Corp.
Metron Instruments
Moisture Register Co.
Natl. Instrument Co.
Pioneer Instrument Co.
Pitometer Log Corp.
Potter Co.
Rowe Radio Res.
Scherr Co., Inc.
Standard Elec. Time
Sticht Co.
(Cont'd)

TACHOMETERS, Electric (Cont'd)
Sun Electric Corp.
Waugh Labs.
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

TACHOMETERS, Electromagnetic
Chicago Elec. Tachometer
Cummings Mach. Works
Eclipse-Pioneer Div.
Electric Auto-Lite
Electric Tachometers
Electro Mechano Co.
General Elec. Co.
Jaeger Watch Co.
Kollsman Inst. Co.
Natl. Instrument Co.
Pioneer Instrument
Standard Elec. Time Co.
Sun Manufacturing
Stewart-Warner Corp.
Triplett Elec. Inst.
Waltham Watch
Westberg Mfg. Co.
Westinghouse Elec.

TACHOMETERS, Fly-ball
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Elec. Tachometer Corp.
Jones Motrola Corp.
Manning, Maxwell & Moore
Sticht Co.
Viking Instrument Co.

TACHOMETERS, Portable
Amthor Testing Inst. Co.
Associated Research
Biddle Co., Jas. G.
Boulin Instrument Corp.
Brigham Co.
Chicago Elec. Tachometer
Coats Mach. Tool Co.
Corbin Screw Corp.
Electro Mechano Co.
Elec. Tachometer Corp.
Foxboro Co.
General Elec. Co.
Hasler-Tel Co.
Jones Motrola Corp.
Manning, Maxwell & Moore
Martindale Electric Co.
Metron Instruments
Rieker Instrument Co.
Scherr Co., Inc.
Sticht Co.
Sun Electric Corp.
Viking Instrument Co.
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Bristol Co.
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Jones Motrola Corp.
Metron Instrument
Sticht Co.
Standard Elec. Time
U. S. Taximeter
Westberg Mfg. Co.

TACHOMETERS, Stroboscopic
Associated Research
Boulin Instrument Corp.
Clarke Inst. Corp.
Coats Mach. Tool
General Radio Co.
L. A. B. Corp.
Stewart-Warner Corp.

TACHOMETERS, Tilting-ring
Amthor Testing Inst. Co.
Coats Mach. Tool Co.
Zernikow Co.

TACHOMETERS, Vibrating Reed
Biddle Co., Jas. G.
J-B-T Instruments

TACHOSCOPES
Amthor Testing Inst. Co.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Metron Instruments
Scherr Co., Inc.
Sticht Co.
Zernickow Co., O.

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Bliss & Co.
Hand & Sons
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TAPES, Steel
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Dietzgen Co.
Keuffel & Esser Co.
Lufkin Rule Co.
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Starrett Co.
United States Blue Print
Warren-Knight Co.
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White Co., Inc.

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TAPES, Woven
General Elec. Co.
Lufkin Rule Co.

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Mogey & Sons
Palos Optical Co.
Perkin-Elmer Corp.
Scherr Co., Inc.
Tinsley Laboratories
Unertl Optical Co.
White Co., Inc.

TELESCOPES, Astronomical
Am. Telescope Labs.
Bausch & Lomb Opt.
Buchele Optical Co.
Clark & Sons
Dome Precision
Eastern Science Co.
Fecker, Inc.
Gaertner Scientific Corp.
Henson Co., Fred C.
Mico Instrument Co.
Mogey & Sons
Palos Optical Co.
Perkin-Elmer Corp.
Swain Nelson Co.
Tinsley Labs.
Unertl Optical Co.
White Co.
Zeiss, Inc., Carl

TELESCOPES, Azimuth
American Optical
Am. Telescope Labs.
Clark & Sons
Fecker, Inc.
Gaertner Scientific Corp.
Kollmorgen Optical Co.
Mogey & Sons
Palos Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Warren-Knight Co.
Warner & Swasey Co.
White Co.
Zeiss, Inc., Carl

TELESCOPES, Bore & Internal Surface, Inspection
American Cystoscope
American Optical
Am. Telescope Labs.
Ames Co., B. C.
Fecker, J. W.
Gaertner Scientific
Gauthier, Donat A.
Gen. Engg. & Model Wks.
Kollmorgen Optical Co.
Leitz, Inc.
Lenox Inst. Co.
Magnaflux Corp.
Mogey & Sons
Perkin-Elmer Corp.
Scherr Co., Inc.
Schneider-Cogswell
Sheffield Corp.
Size Control Co.
Standard Gage
Unertl Optical Co.
Zeiss, Inc., Carl

TELESCOPES, Laboratory
American Optical
Eberbach & Son
Fecker, Inc.
Gaertner Scientific Corp.
Henson Co., Fred C.
Mogey & Sons
Palos Optical Co.
Ruska & Co.
Swain Nelson Co.
Tinsley Laboratories

TELESCOPES, Reflecting
Am. Telescope Labs.
Buchele Optical Co.
Clark Sons
Fecker, Inc.
Fish-Schurman Co.
Gaertner Scientific
Henson Co., Fred C.
Mogey & Sons
Palos Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Swain Nelson Co.
Tinsley Labs.
Unertl Optical Co.
Warner & Swasey Co.
Zeiss, Inc., Carl

TELESCOPES, Refracting
Am. Telescope Labs.
Buchele Optical Co.
Bausch & Lomb. Opt.
Clark & Sons
Fish-Schurman Co.
Fecker, Inc.
Gaertner Scientific
Henson Co., Fred C.
Keuffel & Esser Co.
Mogey & Sons
Palos Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Warner & Swasey Co.
Wollensak Optical Co.
Zeiss, Inc., Carl

TELESCOPES, Zenith
Am. Telescope Labs.
Clark & Sons
Fecker, Inc.
Gaertner Scientific Corp.
Mogey & Sons
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Zeiss, Inc., Carl

TENSIOMETERS
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Boulin Instrument Corp.
Central Scientific Co.
Dillon Co.
Geophysical Inst. Co.
Metron Instrument
Millers Falls
Olsen Testing Machine
Schaevitz Engineering
Suter, Alfred
Statham Labs.
Suter, Alfred
Thwing-Albert
Toledo Scale Co.

TENSION INDICATORS
Baldwin Locomotive
Dillon Co.
General Elec. Co.
Geophysical Inst. Co.
Olsen Testing Mach.
Pacific Scientific Co.
Precision Scientific
Seederer-Kohlbusch, Inc.

TENSION INDICATORS, Textile
Boulin Instrument Corp.
Dillon & Co.
Federal Products Corp.
General Elec. Co.
Olsen Testing Mach.
Statham Labs.
Waugh Labs.

TEST BLOCKS
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Detroit Testing Mach.
Eastern Specialty Co.
Ford Motor Co.
General Elec. Co.
Meter Devices, Inc.
Olsen Testing Mach.
States Co.
Steel City Testing Lab.
Van Keuren Co.

TEST BLOCKS Textile
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Brown & Sharpe
Deming Indicator Co.
Federal Products Corp.
Lewis Engineering
Reich Mfg. Co.
Scherr Co., Inc.
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Airplane M[otor]
Falstrom C[o.]

TEST WEIG[HTS] (See Weights,
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TEST WELL (See The[r]mometer [illegible]t Wells)

TESTERS, A[bsorption]
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Amthor Test[ing] Inst. Co.
Atlas Elec. [Devices Co.]
Baldwin Loc[omotive]
Fidelity Mac[h. Co.]
Gardner Lab[oratory]
General Elec[tric Co.]
Morehouse M[achine Co.]
Olsen Testin[g Machine]
Riehle Div.
Scott Co., H[enry L.]
Shawmut Eng[r. Co.]
Suter, Alfred
Taber Instrum[ent Co.]
Testing Mach[ines, Inc.]
Welch Engine[ering Co.]
Zuhr, Inc., H[enry]

TESTERS, Absorption
Burrell Tech. Supply
Gurley, W. & [L. E.]
Precision Scientific
Testing Machines, Inc.

TESTERS, Air Speed Indicator (See Air Speed Indicator Testers)

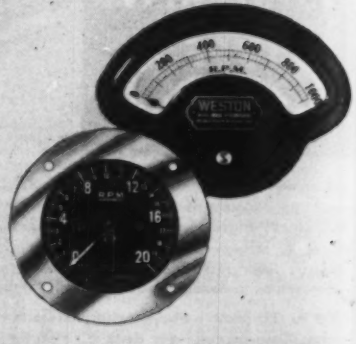
TESTERS, Altimeter (See Altimeter Testers)

TESTERS, Armature
Associated Research, Inc.
Communication Meas. Lab.
Ideal Commutator
Instrument Labs.
Sherron Metallic

TESTERS, Asphalt
American Inst. Co.
Atlas Electric Devices
Braun Corp.
Central Scientific Co.
Chatillon & Sons
Dillon & Co.
Exact Weight Scale
Fish-Schurman Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Olsen Testing Mach.
Philadelphia Thermometer
Precision Scientific Co.
Riehle Div.
Scott Co., Henry L.
Tagliabue Div.
Thwing-Albert Inst.
Western Machinery Co.

TESTERS, Axle
Olsen Testing Mach.
Sperry Products, Inc.

ELECTRICAL TACHOMETERS



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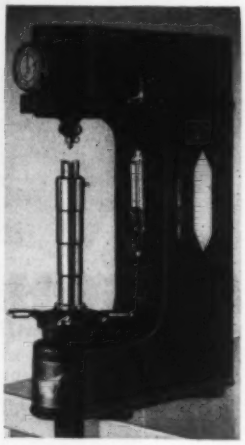

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M-B Instruments
Precision Therm.
Rascher & Betzold
Rieker Inst. Co.
Testrite Inst. Co.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

TESTERS, Bearing
Elgin National Watch
Physicists Research

TESTERS, Beating
Precision Scientific
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS, Brake
American Inst. Co.
Clough-Brengle Co.
Commercial Research
Cramer & Co., Inc.

TESTERS, Chlorine
Everson Mfg. Co.
Hellige, Inc.
Industrial Inst., Inst.
Photovolt Corp.
Precision Scientific
Rascher & Betzold
Suter, Alfred
Taylor & Co., W. A.
Wallace & Tiernan

TESTERS, Coal (See Fuel below)

TESTERS, Coil (Electric)
Associated Research
Boonton Radio Corp.
Clippard Inst. Lab.
Clough-Brengle Co.
General Elec. Co.
General Radio
Ideal Industries
Industrial Insts., Inc.
Instrument Labs.
Kellogg Switchboard
Panoramic Radio Co.
Rubicon Co.
Sherron Metallic
Thordarson Elec. Mfg.
United Transformer

TESTERS, Color
Atlas Electric Devices Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
Gardner Laboratory
General Elec. Co.
Photovolt Corp.
Tagliabue Div.
Testing Machines, Inc.

TESTERS, Condenser
Aerovox Corp.
Associated Research
Clippard Inst. Lab.
Clough-Brengle Co.
Electronic Design Corp.
Electronic Development
General Electric Co.
General Radio Co.
Industrial Insts. Inc.
Instrument Labs.
Jackson Electrical Inst.
Kalbfell Labs., Inc.
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Potter Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Sherron Metallic
Tobe Deutschmann Corp.
Transmitter Equipment
Triplett Electrical Inst.
Weston Elec. Inst. Corp.

TESTERS, Deflection, Light Wave
Acme Industrial
Gaertner Scientific Corp.
Sherron Metallic
Van Keuren Co.

TESTERS, Dew Point
Ferner Co.
General Electric
Refinery Supply Co.
Tagliabue Div.

TESTERS, Dielectric, Properties
American Transformer Co.
Associated Research, Inc.
Electronic Dev. Lab.
General Elec. Co.
General Radio
Instrument Labs.
Leeds & Northrup Co.
Miller Co., B. F.
Roller-Smith Co.
Sherron Metallic
Tagliabue Div.
Westinghouse Elec.

TESTERS, Electroplating (See Electroplating Solution Testing Apparatus)

TESTERS, Emulsion & Demulsibility
Central Scientific Co.

TESTERS, Expansion
Carson Micrometer
Dietert Co.
Dillon & Co.
Exact Weight Scale Co.
Thwing-Albert Inst. Co.
Ferner Co.
Gaertner Scientific Corp.
Thwing-Albert Inst. Co.

TESTERS, Flash Point, Abel's
Central Scientific Co.
Ruehfel Co.

TESTERS, Flash Point, Abel-Pensky's (See Abel's above)

TESTERS, Flash Point, Cleveland Open Cup
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Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Ruehfel Co.
Tagliabue Div.

TESTERS, Flash Point, Elliott Closed Cup
American Inst. Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Div.

TESTERS, Flash Point, Pensky-Martens
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Div.

TESTERS, Flash Point, Tag Closed
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Div.

TESTERS, Flatness, Light Wave
Acme Industrial
Baird Associates
Bausch & Lomb
Crystal Research Labs.
Fecker, J. W.
Fish-Schurman Co.
Gaertner Scientific Co.
Geophysical Inst. Co.
Optron Laboratory
Scherr Co., Inc.
Sherron Metallic
Van Keuren Co.
Zeiss, Inc., Carl

TESTERS, Fluorescent Lighting
Echo Electrical
Littelfuse, Inc.
Skaneateles Mfg.
Sylvania Elec. Prod.

TESTERS, Freeness
Bristol Co.
Dietert Co.
Testing Machines, Inc.
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TESTERS, Fuel
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Burrell Technical Supply
Central Scientific Co.
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Parr Instrument Co.
Precision Scientific
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Sturtevant Mill
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TESTERS, Gas (See Gas Analyzers)

TESTERS, Gear
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Krouse Testing Mach.
Morse Twist Drill
Olsen Testing, Mach.
Scherr Co., Inc.

TESTERS, Glue
Central Scientific Co.
Dillon & Co.
Fish-Schurman Co.
Olsen Testing Machine
Thwing-Albert Inst. Co.

TESTERS, Grain
Central Scientific Co.
Cuthbert Co.
Exact Weight Scale
Gump Co.
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Seedburo Equipment
Tagliabue Div.
Toledo Scale Co.
Troemner, Henry

TESTERS, Grease (See Grease Testing Apparatus)

TESTERS, Grinding Wheel
Olsen Testing Machine

TESTERS, Ground Resistance
Associated Research
Automatic Electric Sales
Biddle Co., Jas. G.
Geophysical Inst. Co.
Gray Instrument
Helland Research
Industrial Insts., Inc.
Instrument Labs.
Shallcross Mfg.
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Sticht & Co.

TESTERS, Hardness of Grindable Materials
Ames Precision Machine
Ferner Co.
Gardner Laboratory
Gordon Co., Claud S.

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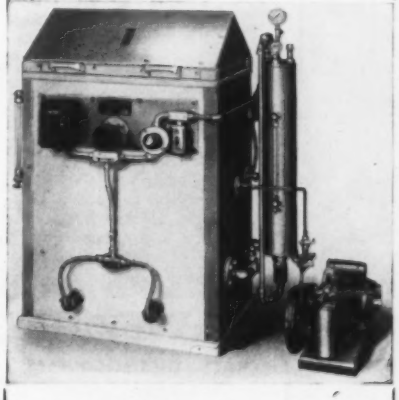

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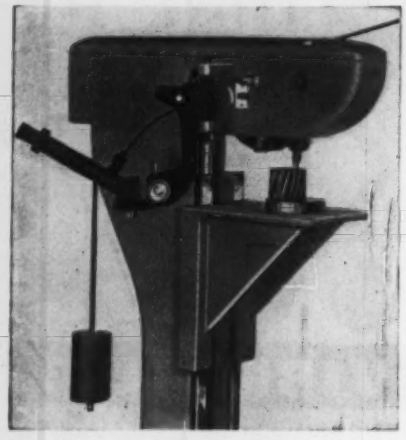

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Associated Research
Automatic Electric Sales
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Communication Meas. Lab.
Freed Transformer
General Elec. Co.
General Radio Co.
Geier & Bluhm
Ideal Industries, Inc.
Industrial Insts., Inc.
Islip Radio Mfg.
Kellogg Switchboard
Leeds & Northrup Co.
Martindale Electric Co.
Miller Co., Bertrand F.
Rawson Electrical Inst.
Rubicon Co.
Scott Co., Henry L.
Shalleross Mfg. Co.
Sherron Metallic
States Co.
Sticht Co.
Superior Insts.
United Transformer Corp.
Westinghouse Elec.
Weston Elec. Inst.
Winslow Co.

TESTERS, Insulation (Thickness)
Comtor Co.
General Elec. Co.
Instrument Specialties Co.

TESTERS, Jelly
Chatillon & Sons
Fish-Schurman Co.

TESTERS, Laundering
Atlas Electric Devices

TESTERS, Magnetic
American Inst. Co.
Annis Co.
Associated Research
Baird Associates
General Elec. Co.
General Radio
Geophysical Inst. Co.
Instrument Labs.
Magnaflux Corp.
(Cont'd)

TESTERS, Magnetic (Cont'd)
Magnetic Analysis Corp.
Pioneer Instrument
Rawson Elec. Instr. Co.
Rubicon Co.
Ruska Inst. Corp.
Sherron Metallic

TESTERS, Malt
Brabender Corp.
Rieker Instrument Co.
Seedburo Equipment

TESTERS, Mica
Boonton Radio Corp.

TESTERS, Mileage (See Meters, Mileage)

TESTERS, Milk
Central Scientific Co.
Kimble Glass
Munsell Color Co., Inc.
Photovolt Corp.
Rieker Inst. Co.
Roehfel Co.
Scientific Glass App.
Standard Elec. Time
Testrite Instrument Co.
Tagliabue Div.

TESTERS, Moisture
Alpha-Lux Co.
American Inst. Co.
American Moistening Co.
Brabender Corp.
Brown Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Cuthbert Co.
Delmhorst Instrument
Dietert Co.
Electronic Products Co.
Exact Weight Scale
Ferner Co.
Fisher Scientific Co.
General Elec. Co.
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Kaydel Corp.
Moist-O-Meter, Inc.
Moisture Register Co.
Precision Scientific Co.
Rascher & Betzold
Refinery Supply Co.
Scientific Glass App.
Sci. Inst. Co. (of Detroit)
Seedburo Equipment
Shalleross Mfg. Co.
Sodemann Heat & Power
Suter, Alfred
Tagliabue Div.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Toledo Scale Co.
Troemner, Henry
Williams Apparatus Co.

TEST INSULATION
THE MODERN WAY

...WITH A

MEGOHMER
NEW NON-CRANKING TYPES

No more tiresome cranking of a hand-driven generator. Steady test potential of 500 volts D. C. instantly available at turn of switch. Direct readings of insulation resistances without calculations. Two types, Model B-7 and C-2. Ranges 0-20/200 megohms, and 0-100/1000 megohms with 1, 2 or 3 additional ohm scales in same instrument. *Write for Bulletin Nos. 440, 445.*

HERMAN H. Sticht COMPANY, INC.
27 PARK PLACE NEW YORK, N. Y.

Winslow ELECTRIC MEASURING AND TESTING INSTRUMENTS

The WINSLOW line includes Wheatstone, Kelvin, Varley, Murray Limit and Megohm bridges.

WINSLOW megohmmeters are available in ranges to 1000 megohms at 500 volts.

AIRCRAFT THERMOCOUPLES, IGNITION TEST SETS, INSULATION TEST SETS, BRIDGES, MEGOHMMETERS, POTENTIOMETERS, TACHOMETERS, VACUUM GAUGES.

The WINSLOW line of portable electrical instruments for measuring direct currents, alternating currents, resistance, temperature, speed, vacuum and insulation, etc., are ruggedly constructed to maintain accuracy under severe usage. Special design precautions are incorporated for complete immunity to dust, dirt and moisture. A complete line of thermocouples is included. Write today!

THE WINSLOW CO.
9 LIBERTY STREET, NEWARK 5, NEW JERSEY

Mullen Testers

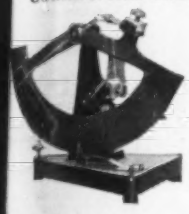
There are occasions when the texture as well as the excessive bursting strength of a material requires a machine of unusual strength and rigidity. Model A Jumbo Mullen Tester meets these requirements 100 per cent.

B. F. PERKINS & SON, INC.
Engineers and Manufacturers
HOLYOKE, MASS.

THWING-ALBERT INSTRUMENT COMPANY

5323 PULASKI AVE.
PHILADELPHIA 44, U. S. A.

Commercial Instruments of Laboratory Accuracy

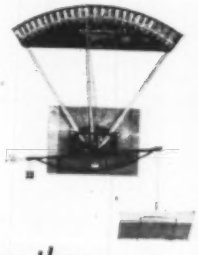


ELMENDORF TEARING TESTER

For 25 years a standard in the paper industry. Dependent upon gravity for its operation, the readings must be correct. Any two Elmendorfs anywhere will perform alike under like conditions.

BASIS WEIGHT SCALE

(Wall Type)



Instantly indicates the weight in pounds per ream directly from the weight of a single sheet of paper. Perfectly adapted to moisture content determinations.

We also manufacture the:

Desk Type Basis Weight Scale
Electro-Hydraulic Tensile Strength Tester
Clark Softness-Stiffness Tester

Currier Size Tester	Penescope
Formation Tester	Inkometer
Portable pH Meter	Vapometer

47 YEARS MAKING FINE INSTRUMENTS

11

TESTERS, Non destructive electrical for physical properties
Baldwin Locomotive
Cady & Co.
Ferner Co.
General Radio
Magnaflux Corp.
Sperry Products
Thwing-Albert Inst. Co.
Waugh Labs.

TESTERS, Oil
American Inst. Co.
Central Scientific Co.
Fish-Schurman Co.
Hellige, Inc.
Humboldt Mfg. Co.
Kimble Glass
Mico Instrument Co.
Precision Scientific Co.
Ricker Inst. Co.
Ruehfel Co.
Ruska & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Div.
Western Machinery Co.

TESTERS, Oxygen
American Inst. Co.
Burrell Technical Supply
General Elec. Co.
Precision Scientific
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Div.

TESTERS, Paint
Akatos, Inc.
American Inst. Co.
Atlas Elec. Devices Co.
Central Scientific Co.
Dillon & Co.
Fish-Schurman Co.
Gardner Laboratory
General Elec. Co.
Munsell Color Co.
Photovolt Corp.
Ruehfel Co.
Scott Co., Henry L.
Taber Instrument Co.
Thermo-Electric
Van Keuren Co.
Zuhr, Inc., Henry

TESTERS, Paper, Curl
Thwing-Albert Inst. Co.

TESTERS, Paper Formation
Dillon & Co.
Fuess, Inc.
Gardner Laboratory
General Elec. Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS, Paraffin
American Inst. Co.
Olsen Testing Mach.
Perkins & Son
Precision Scientific
Ruehfel Co.
Tagliabue Div.

TESTERS, Penetration (Paper)
Olsen Testing Mach.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS, Petroleum (See Oil above)

TESTERS, Phosphate
Permutit Co.
Taylor & Co., W. A.

TESTERS, Pistol Barrel Optical
Kollmorgen Optical Co.
Lenox Inst. Co.
Scherr Co., Inc.

TESTERS, Piston Ring
Amer. Measuring Insts.
Gordon Co., Claud S.
Link Engineering

TESTERS, Pitch
American Inst. Co.
Precision Scientific Co.

TESTERS, Plasticity
American Inst. Co.
Brabender Corp.
Dietert Co.
Dillon & Co.
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Scott Co., Henry L.
Steel City Testing
Testing Machines, Inc.

TESTERS, Porosity
Ferner Co.
Gurley, W. & L. E.
Precision Scientific
Ruska & Co., Inc.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Westinghouse Elec.
Williams Apparatus Co.

TESTERS, Pulp
Hart Moisture Gage
Perkins & Son
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS, Radio Set (See Analyzers, Radio Set)

TESTERS, Radio Tube (See Analyzers, Radio Set)

TESTERS, Resistance
Assembly Products
Associated Research, Inc.
Automatic Electric Sales

TESTERS, Resistance (Cont'd)
Biddle Co., James G.
Communication Meas. Lab.
Electronic Dev. Lab.
Freed Transformer
General Elec. Co.
General Radio Co.
Gray Instrument Co.
Ideal Industries, Inc.
Industrial Instruments
Instrument Labs.
Leeds & Northrup Co.
National Tech. Labs.
Nosker Eng. Prod.
RCA Manufacturing
Rubicon Co.
Shallcross Mfg. Co.
Sticht Co.
Supreme Instrument Corp.
Sylvania Elec. Prod.
Triplett Electrical Inst.
Westinghouse Elec.
Weston Electrical Inst.

TESTERS, Salt Spray
American Instrument Co.
Atlas Electric Devices
Industrial Filter

TESTERS, Sand
Chatillon & Sons
Dietert Co.
Exact Weight Scale Co.
Hart Moisture Gage
Humboldt Mfg. Co.

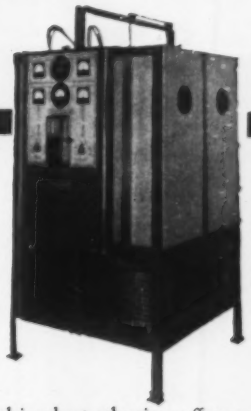
TESTERS Slowness
Testing Machines, Inc
Williams Apparatus Co.

TESTERS, Softness
Dillon & Co.
Ferner Co.
Gurley, W. & L. E.
Humboldt Mfg. Co.
Olsen Testing Mach.
Precision Scientific
Taber Instrument Co.
Thwing-Albert Inst. Co.

TESTERS, Spark Plug
Amerline
Centralab Div.
Rowe Radio Res.

TESTERS, Strain (Glass)
Baird Associates
Bausch & Lomb Opt.
Fecker, J. W.
Fish-Schurman Corp.
Gaertner Scientific Corp.
General Elec. Co.
Kollmorgan Optical Co.
Olsen Testing Mach.
Pfaltz & Bauer, Inc.
Plummer & Kershaw
Polarizing Instrument Co.
Precision Scientific
Zeiss, Inc., Carl

ACCELERATED TESTING *for* WEATHERING and FADING OF MATERIALS



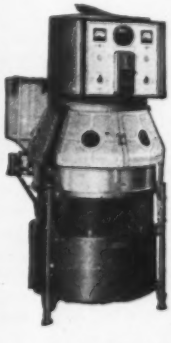
ATLAS TWIN-ARC WEATHER-OMETER

Faithfully duplicates the combined weathering effects of sunlight, rain, heavy dew and thermal shock; accelerated to reduce years of actual weathering to a few days of testing.

Full automatic control of light and water periods is provided by the Atlas cycle timer unit which can be set to meet standard and special requirements of weathering tests. After setting exposure cycles on the control panel, the Weather-Ometer can be safely left in continuous operation without attention.

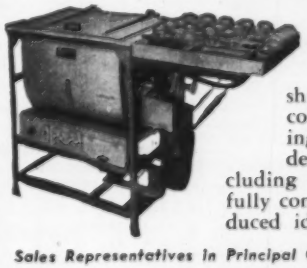
The Atlas Weather-Ometer proves the durability of materials under exact conditions of weathering found in actual use in outdoor exposure.

ATLAS FADE-OMETER



The recognized standard testing machine for determining the fastness to light of any material or finishes. Specimens are rotated around the Atlas Enclosed Violet Arc — the closest approach to natural sunlight —in masked holders. Automatic temperature control to within ±3° F. and humidity regulated by a constant reservoir according to requirements of tests. Operation is completely automatic without attention from operator; can be left in continuous operation overnight.

ATLAS LAUNDER-OMETER



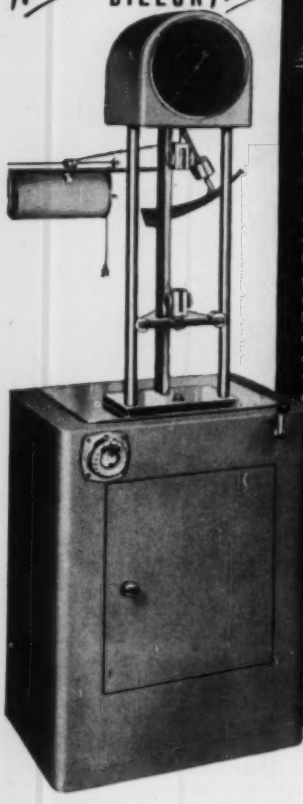
Standard laboratory washing machine of A.A.T.C.C. Tests washing action, textile shrinking, staining, and color fastness to dry cleaning solvents, soaps and detergents. All factors, including washing action, carefully controlled—can be reproduced identically at any time.

Sales Representatives In Principal Cities All Over the World

A new and improved accelerated weathering machine formerly manufactured by the National Carbon Co. as the "National Accelerated Weathering Unit" will soon be available as an Atlas product and identified as Model NXC-48.

ATLAS ELECTRIC DEVICES CO.
361 West Superior Street, Chicago 10, Illinois

Another DILLON first



THE NEW
Dillon
MULTI-LOW RANGE
UNIVERSAL TESTER

IT'S ACCURATE! IT'S DIFFERENT! IT'S MODERN! This outstanding new tester has FOUR ranges all reading in ounces for the most precise, analytical work. 0-10 pounds, 0-25 pounds, 0-50 pounds, 0-100 pounds. Pendulum type—actually calibrated with dead weights. Packed with new features! Color coded dial, aluminum grips, elongation scale. Completely motorized with stepless speed control forward or reverse.

- Automatic stress-strain recorder with adjustable magnification. Also elongation scale.
- Limiting switches prevent accidental over-run. Lower grip fully adjustable. Upper grip has ball-socket.
- Comes in various heights for long or short specimens. Tests in TENSILE, COMPRESSION, TRANSVERSE, SHEAR.
- LOW in price. The perfect tester for wire, plastics, paper, ceramics, rubber, etc.

Write for set of actual photographs and complete specifications.

W. C. DILLON & CO., INC.
5415 W. HARRISON ST., CHICAGO 44, ILL.

INKLESS TEMPERATURE RECORDER

remote recording from resistance temperature detectors

Consisting of two compact units (an inkless strip-chart recorder and an external power unit), the new G-E Type CF-2 temperature recorder can be used with resistance temperature detectors (RTD's) already installed in generators, transformers, and other large electric apparatus, or with separate detector units to record temperature in ovens, heat-treating tanks, refrigerating machines, air ducts, and liquid-handling systems.

ELECTRICALLY OPERATED—SCALE RANGE 20-140 DEGREES C

On a four-inch strip chart, this equipment produces a clear record of the temperature variations that effect resistance changes in standard, ten-ohm RTD's heretofore used mainly with indicating instruments. The 115-volt Telechron motor can be adjusted to provide record lengths of from eight days to two years on a single 65-foot chart. By using a suitable transfer switch, a single equipment may be used with several detector units for multiple recordings.

Lightweight and portable, the Type CF-2 temperature recorder is probably the lowest-priced, remote-recording instrument on the market. And to suit diverse requirements, a variety of RTD's are available as accessories. Complete details are listed in Bulletin GEA-4572. Call the nearest G-E office for your copy or write to *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

TESTERS, Tachometer
American Time Prods.
Amthor Testing Inst.
Associated Research
Biddle Co., Jas. G.
Consol. Ashcroft Hancock
Elec. Tachometer Corp.
General Elec. Co.
Globe Industries
Ideal Lab. Tool
Metron Instrument
Pioneer Instrument
Precision Scientific
Rieker Inst. Co.
Rowe Radio Research
Standard Elec. Time
Sticht Co.
Sun Manufacturing
Zeiss, Inc., Carl
Zernickow Co., O.

TESTERS, Tenderness
American Inst. Co.
Humboldt Mfg. Co.
Precision Scientific Co.

TESTERS, Thermometer
Amthor Testing Inst.
Consol. Ashcroft Hancock
Freas Glass Works
Fried & Lustig
G. M. Mfg. Co.
Green, Henry J.
J-B-T Instruments
Hiergesell & Sons
Huddleston, J. S. F.
Lewis Engineering
Moeller Instrument Co.
Nurnberg Thermometer
Palmer Co.
Ruehfel Co.
Schultheis Corp.
Tagliabue Div.
Thwing-Albert Inst. Co.
Wagner & Son
Weksler Thermometer

TESTERS, Torque and Torque Wrench
Airdraulics Engineering
Chatillon & Sons
Olsen Testing Mach.
Sturtevant Co.

TESTERS, Turn Indicator
Amthor Testing Inst. Co.
Globe Industries
Ideal Lab. Tool
Pioneer Instrument
Rieker Instrument Co.
Ruehfel Co.

TESTERS, Vapor Transmission
Thwing-Albert Inst. Co.

TESTERS, Varnish
Atlas Elec. Devices Co.
Dillon & Co.
Fish-Schurman Co.
Gardner Laboratory
Hellige, Inc.
Photovolt Corp.
Taber Instrument Co.
Thermo-Electric Co.
Zuhr, Inc., Henry

TESTERS, Voltage
Associated Research
Clough-Brengle Co.
Electronic Associates
Electronic Dev. Lab.
General Elec. Co.
Ideal Industries, Inc.
Instrument Labs.
Islip Radio Mfg.
Lyman Electronic
MacLeod & Hanopol
Norton Electrical Inst.
Precision Apparatus
Potter Co.
RCA Div.
Shallcross Mfg. Co.
Sherron Metallic
Sticht Co.
Sylvania Elec. Prod.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

TESTERS, Watch Rate
American Time Prods.
Paulson & Co.
Potter Instrument

TESTERS, Water Meter
Badger Meter Co.
Barnstead Still
Exact Weight Scale
Fischer & Porter
Neptune Meter Co.
Toledo Scale Co.

TESTERS, Water Penetration
Biddle Co., Jas. G.
Hart Moisture Gage
Thwing-Albert Inst. Co.

TESTERS, Watthour Meter
Eastern Specialty Co.
Elec. Facilities, Inc.
General Elec. Co.
Hathaway Inst. Co.
Sangamo Electric Co.
Sangamo Electric Co.
States Co.
Western Electric-Mech.
Westinghouse Elec.

TESTERS, Weathering
Atlas Elec. Devices Co.
Electric Hotpack Co.
Gen. Elec. Lamp Dept.
National Carbon Co.
Precision Scientific

TESTING INSTRUMENTS, Optical
Acme Industrial
American Meas. Insts.
American Optical
Am. Telescope Labs.
Bausch & Lomb Optical
Ferner Co.
Fish-Schurman Corp.
Fuess, Inc.
(Cont'd)

TESTING INSTRUMENTS, Optical (Cont'd)
Gaertner Scientific Corp.
Geophysical Inst. Co.
Gordon Co.
Jones & Lamson Machine
Kollmorgen Optical Co.
Larrimore Sales
Leitz, Inc.
Mogey & Sons
Optron Laboratory
Palos Optical Co.
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Precision Scientific
Pyrometer Inst. Co.
Unertl Optical Co.

TESTING MACHINES, Alternating Stress
Baldwin Locomotive
Brush Development Co.
Krouse Testing Machine
Olsen Testing Machine
Riehle Div.
Suter, Alfred

TESTING MACHINES, Bearing
Olsen TestingMachine
Physicists Research
Precision Scientific
RCA Manufacturing Co.
Suter, Alfred

TESTING MACHINES, Bending
Baldwin Locomotive
Detroit Testing Mach.
Dillon & Co.
Dorr-Patterson Engr.
Ferner Co.
Hayes Scientific App.
Instrument Specialties
Krouse Testing Mach.
Morehouse Machine Co.
Olsen Testing Machine
Riehle Div.
Steel City Testing Lab.
Suter, Alfred
Taber Instrument Co.
Thwing-Albert Inst.

TESTING MACHINES, Brinell
Ames Precision Machine
Detroit Testing Mach.
DoAll Co.
Ferner Co.
King, Andrew
Olsen Testing Machine
Pittsburgh Inst. & Mach.
Riehle Div.
Steel City Testing Lab.
Suter, Alfred
Testing Machines, Inc.

TESTING MACHINES, Brittleness
Baldwin-Southwark Corp.
Olsen Testing Mach.
Precision Scientific
Riehle Div.

TESTING MACHINES, Bursting
Amthor Testing Inst. Co.
Mansfield & Green
Olsen Testing Mach.
Perkins & Son, Inc.
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst.

TESTING MACHINES, Cable
Amthor Testing Inst.
Associated Research
Atlas Electric Devices
Automatic Elec. Sales
Baldwin Locomotive
Boulin Instrument Corp.
Communication Meas. Lab.
Dillon & Co.
General Elec. Co.
Kellogg Switchboard
Krouse Testing Mach.
Leeds & Northrup Co.
Olsen Testing Machine
Riehle Div.
Rubicon Co.
Scott Co., Henry L.
Shallcross Mfg. Co.
Sherron Metallic
Suter, Alfred
Thordarson Elec. Mfg.
Thwing-Albert Inst.

TESTING MACHINES, Cement
American Inst. Co.
Baldwin Locomotive
Bowen & Co.
Burrell Tech. Supply
Central Scientific Co.
Dillon & Co.
Exact Weight Scale Co.
Federal Pneumatic Sys.
Fisher Scientific Co.
Hayes Scientific App.
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Refinery Supply Co.
Riehle Div.
Scientific Inst. Co.
Scott Co., Henry L.
Sodemann Heat & Power
Suter, Alfred
Western Machinery Co.

TESTING MACHINES, Chain
Baldwin Locomotive
Dillon & Co.
Krouse Testing Mach.
Olsen Testing Mach.

TESTING MACHINES, Compression
Baldwin Locomotive
Chatillon & Sons
Detroit Testing Mach.
(Cont'd)

TESTING MACHINES, Compression (Cont'd)
Dillon & Co.
Dorr-Patterson Engr.
Electro Products Labs.
Exact Weight Scale Co.
Ferner Co.
Krouse Testing Mach.
Link Engineering
Olsen Testing Machine
Perkins & Son, Inc.
Potter Co.
Precision Scientific
RCA Manufacturing
Riehle Div.
Scott Co., Henry L.
Steel City Testing Lab.
Suter, Alfred
Testing Mach. Co., Inc.
Toledo Scale Co.
Thwing-Albert Inst.

TESTING MACHINES, Concrete (See Cement above)

TESTING MACHINES, Creep
Baldwin Locomotive
Carson Micrometer
Ferner Co.
Gaertner Scientific Corp.
L. H. Marshall
Olsen Testing Machine
Riehle Div.
Suter, Alfred

TESTING MACHINES, Damping
Baldwin Locomotive

TESTING MACHINES, Deflection
Carson Micrometer
Link Engineering
Olsen Testing Mach.
Scott Co., Henry L.

TESTING MACHINES, Diaphragms
Carson Micrometer
Krouse Testing Mach.

TESTING MACHINES, Ductility
Bock Machine Co.
Central Scientific Co.
Dillon & Co.
Detroit Testing Mach.
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Riehle Div.
Scott Co., Henry L.
Steel City Testing Lab.
Suter, Alfred
Testing Machines, Inc.

TESTING MACHINES, Fatigue
All American Tool (Vibration)
Baldwin Locomotive
Ferner Co.
General Elec. Co.
Hathaway Inst. Co.
Hays Scientific App.
Krouse Testing Mach.
L. A. B. Corp.
Link Engineering
Martin-Hubbard Corp.
Olsen Testing Machine
Precision Scientific
Raytheon Mfg. Co.
Ruehfel Co.
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.
Westinghouse Elec.
Zuhr, Inc., Henry

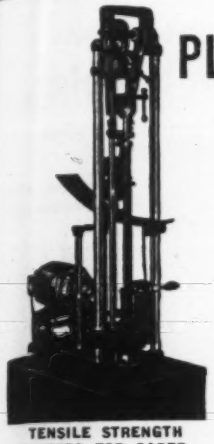
TESTING MACHINES, Folding Endurance (Paper)
American Inst. Co.
Amthor Testing Inst. Co.
Olsen Testing Machine
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTING MACHINES, Gummed Tape
Amthor Testing Inst.
Dillon & Co.
Scott Co., Henry L.
Thwing-Albert Inst. Co.

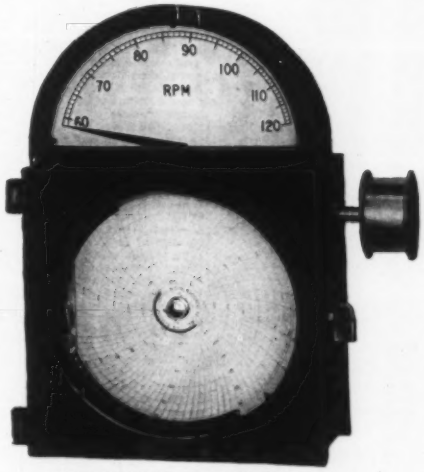
TESTING MACHINES, Hardness
American Optical
Ames Precision Machine
Barber-Colman Co.
Clark Instrument
Detroit Testing Mach.
Dietert Co.
Eitzen Co.
Ferner Co.
Fisher Scientific Co.
General Elec. Co.
Gogan Machine
Gordon Co., Claud S.
King, Andrew
Leitz, Inc.
Olsen Testing Machine
Pittsburgh Inst. & Mach.
Precision Scientific
Riehle Div.
Shore Instrument
Size Control Div.
Steel City Testing Lab.
Suter, Alfred
Swedish Gage
Testing Machines, Inc.
Wilson Mech. Inst. Co.
Zeiss, Inc., Carl

TESTING MACHINES, High Pressure (for Hose Lines & hydraulic devices)
Electro Products Labs.
Hydraulic Controls
Mansfield & Green
Steel City Testing Lab.

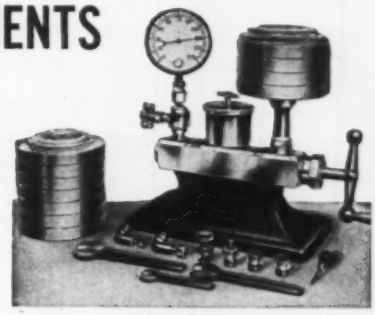
PLANT and LABORATORY INSTRUMENTS



TENSILE STRENGTH TESTERS FOR PAPER, CORDAGE, RUBBER, WIRE, ETC.



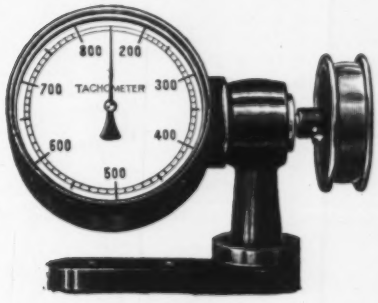
PAPER MACHINE TACHOMETERS
(Recording and Indicating)



DEAD WEIGHT
PRESSURE GAUGE TESTERS
Capacities to 5000 lbs.

DEAD WEIGHT THICKNESS GAUGE 1/10,000 DIV.

ALSO—PAPER BURSTING STRENGTH TESTERS
POCKET AND DESK SCALES (Paper and Cordage)
PAPER MICROMETERS (Desk and Pocket)
FOLDING ENDURANCE TESTER
ALUMINUM FOIL SCALES



(Centrifugal type)
STATIONARY TACHOMETERS

Amthor Testing Instrument Co., Inc.
49a Van Sinderen Avenue, Brooklyn, N. Y.

TESTING MACHINES, Impact
Baldwin Locomotive
Cambridge Inst. Co.
Ferner Co.
Gordon Co., Claud S.
Gorrell & Gorrell
Impact Register Co.
Olsen Testing Machine
Precision Scientific
Radio Frequency Labs.
Scott Co., Henry L.
Riehle Div.
Size Control Co.
Steel City Testing Lab.
Testing Machines, Inc.
Thwing-Albert Inst.
Zuhr, Inc., Henry

TESTING MACHINES, Initial Tearing
Precision Scientific
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTING MACHINES, Knit Goods (See Textile below)

TESTING MACHINES, Leather
Amthor Testing Inst. Co.
Central Scientific Co.
Dillon & Co.
Olsen Testing Machine
Perkins & Son
Riehle Div.
Scott Co., Henry L.
Taber Instrument Co.

TESTING MACHINES, Paper
American Inst. Co.
Amthor Testing Inst. Co.
Atlas Elec. Devices
Bausch & Lomb
Cady & Co., E. J.
Central Scientific Co.
Dietert Co.
Dillon & Co.
Emerson Apparatus Co.
Federal Prod. Corp.
Ferner Co.
Fuess, Inc.
General Elec. Co.
Gurley, W. & L. E.
Hart Moisture Gage
Olsen Testing Machine
Perkins & Son
Photovolt Corp.
Riehle Div.
Scott Co., Henry L.
Speidel & Co.
Steel City Testing
Taber Instrument Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
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Riehle Div.
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Suter, Alfred
Steel City Testing
Taber Inst. Corp.
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Olsen Testing Mach.
Steel City Testing
Suter, Alfred
Taber Inst. Co.
Testing Machines, Inc.
Zuhr, Inc., Henry

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Dillon & Co.
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Humboldt Mfg. Co.
Olsen Testing Machine
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Baldwin Locomotive
Bock Machine Co.
Branson Instruments
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Krouse Testing Mach.
Olsen Testing Machine
Riehle Div
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Steel City Testing
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Suter, Alfred
Taber Instrument Co.
Thwing-Albert Inst. Co.
Toledo Scale Co.

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Dillon Co.
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Suter, Alfred
Taber Instrument Co.
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TESTING MACHINES, Thread
Boulin Instrument Corp.
Dillon & Co.
Olsen Testing Mach.
Scott Co., Henry L.
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TESTING MACHINES, Torsion
Airdaulics Engineering
Baldwin Locomotive
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Chatillon & Sons
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Exact Weight Scale
Hathaway Inst. Co.
Hayes Scientific App.
Krouse Testing Mach.
Link Engineering
Martin-Hubbard Corp.
Metron Instrument
Olsen Testing Mach.
Riehle Div.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Testing Machines, Inc.
Toledo Scale Co.
Waugh Laboratories

TESTING MACHINES, Torsional Creep
Baldwin Locomotive
Suter, Alfred

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Sticht Co.
Televiso Products
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Baldwin Locomotive
Dillon & Co.
General Elec. Co.
Krouse Testing Mach.
Morehouse Mach. Co.
Olsen Testing Machine
Riehle Div.
Rubicon Co.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Taber Instrument Co.
Thwing-Albert Inst. Co.

TESTING MACHINES, Yarn
Atlas Elec. Devices Co.
Brown Inst. Co.
Dillon & Co.
Emerson Apparatus Co.
Hart Moisture Gage
Olsen Testing Mach.
Scott Co., Henry L.
Suter, Alfred
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Olsen Testing Machine
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Olsen Testing Mach.
Riehle Div.

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities over 100,000 lb.
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Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.

TESTING MACHINES, Universal, Hydraulic, Capacities 0-100 lb.
Dietert Co., Harry W.
Gordon Co., Claud S.
Olsen Testing Mach.
Steel City Testing Lab.
Thwing-Albert Instrument

TESTING MACHINES, Universal, Hydraulic, Capacities 100-5000 lb.
Baldwin Locomotive
Detroit Testing Machine
Dietert Co., Harry W.
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Ferner Co.
Gordon Co., Claud S.
Olsen Testing Mach.
Riehle Div.
Steel City Testing Lab.

TESTING MACHINES, Universal, Hydraulic, Capacities 5000-100,000 lb.
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Detroit Testing Mach.
Gordon Co., Claud S.
Olsen Testing Mach.
Pittsburgh Instrument
Riehle Div.
Steel City Testing Lab.
Testing Machines, Inc.
Wroble Engineering Co.

TESTING MACHINES, Universal, Hydraulic, Capacities over 100,000 lb.
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Gordon Co., Claud S.
Olsen Testing Mach.
Riehle Div.

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Dietert Co.
Dillon & Co.
Gordon Co., Claud S.
Olsen Testing Mach.
Riehle Div.
Scott Co. Henry L.
Steel City Testing
Suter, Alfred
Thwing-Albert Inst. Co.

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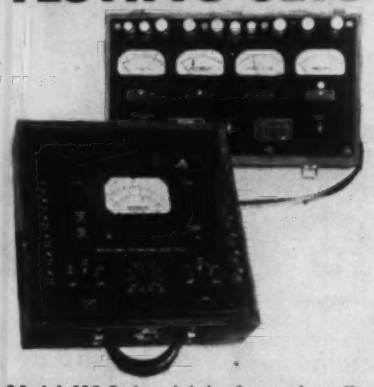

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Hayes Scientific App.
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Scott Co., Henry L.
Toledo Scale Co.

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Chatillon & Sons
Gordon Co., Claud S.
Olsen Testing Mach.
Riehle Div.
Scott Co., Henry L.
Toledo Scale Co.

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Reiner Electronics
Shallcross Mfg.
Sherron Metallic
Sylvania Elec. Prod.
Televisio Products
Transmitter Equipment
United Transformer Corp.
Weston Elec. Inst. Corp

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Federal Telegraph Co.
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States Co.
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Umco Mfg. Co.
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Westinghouse Elec.
Weston Elec. Inst. Corp.

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Gray Instrument
Leeds & Northrup
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Tagliabue Div.
Thwing-Albert Instrument

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Geophysical Inst. Co.
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Leeds & Northrup
Niagara Elec. Inst.
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Sensitive Research Inst.
Shallcross Mfg.
Sherron Metallic
Sticht Co.
Thwing-Albert Inst. Co.

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Sherron Metallic
Sticht Co.
Thordarson Elec. Mfg.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.
Winslow Co.

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Elec. Facilities, Inc.
Electronic Development
General Elec. Co.
Gray Instrument
Meter Devices Co.
Roller-Smith Co.
Rubicon Co.
Sherron Metallic
Sticht Co.
Triplett Elec. Inst.
Umco Mfg. Co.
West. Electro-Mechanical
Weston Elec. Inst. Corp.

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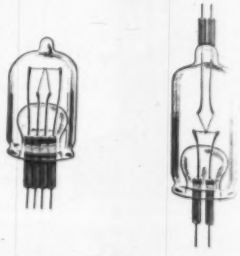

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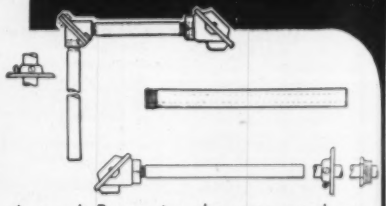

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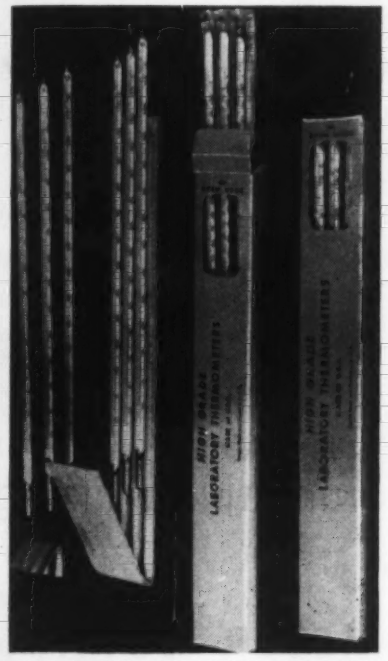

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TESTING SIEVES (See Sieves, Testing)

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THEODOLITES, Pilot Balloon
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Ballantine Labs.
Biddle Co.
Cambridge Inst. Co.
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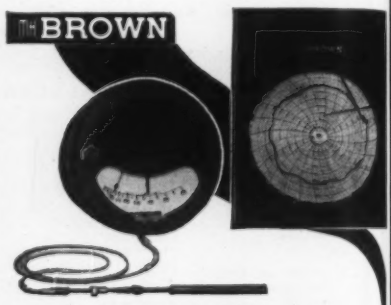

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THERMOMETERS

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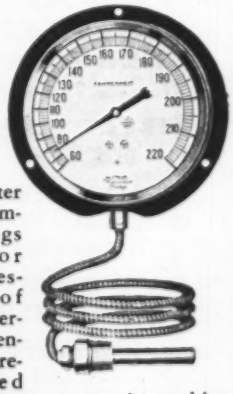

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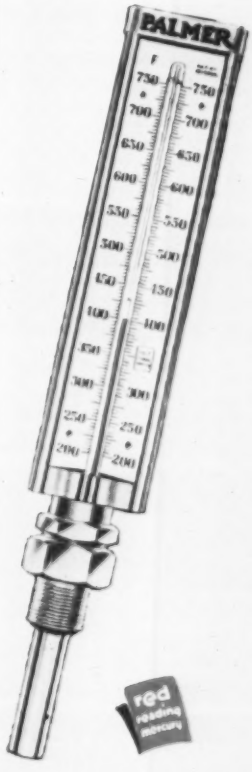

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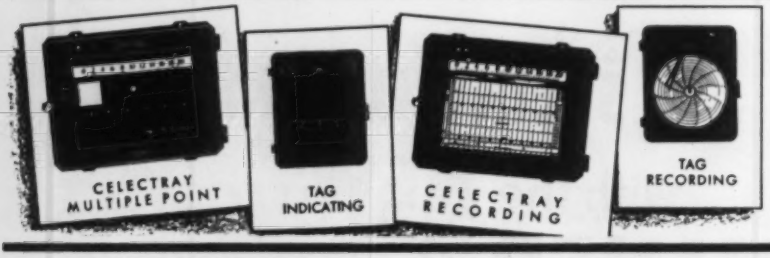

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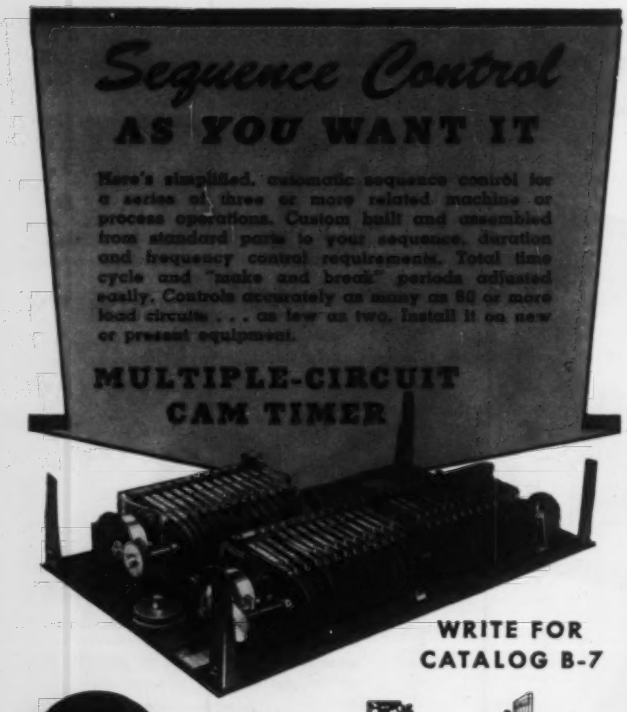
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Lektra Labs.
Lumenite Co.
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Electronic Controls
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Industrial Timer
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Seely Inst. Co., Inc.
Serdex, Inc.
Standard Elec. Time
Stromberg Time Corp.
Struthers Dunn
Tagliabue Div.
Taylor Inst. Cos.
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Weston Elec. Inst. Corp.
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Waugh Laboratories

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Baldwin-Southwark Corp.
Commercial Research
Consolidated Engg.
Waugh Labs.

TORSION METERS
Airdraulics Engineering
Boulin Inst. Corp.
Chatillon & Sons
Cummings Mach. Works
Hathaway Inst. Co.
Kurman Electric Co.
McNab of Bridgeport
Riehle Div.
Toledo Scale Co.

TOTALIZERS, Demand
American Meter Co.
General Elec. Co.
Landis & Gyr
Westinghouse Elec.

TOTALIZERS, Electric Energy
Autocall Co.
Automatic Elec. Sales
Bristol Co.
Esterline Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
Leeds & Northrup
Westinghouse Elec.

TOTALIZERS, Fluid Flow
American Meter Co.
Bailey Meter Co.
Bristol Co.
Brooks Rotameter
Brown Inst. Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
General Elec. Co.
Hagan Corp.
Hays Corp.
Hennzey Co.
Leupold & Stevens
Mason-Neilan Regulator
Penn Ind. Inst. Corp.
Republic Flow Meters
Revere Corp.
Simplex Valve & Meter
Smith Meter
Sparling, R. W.
Tagliabue Div.
Taylor Inst. Cos.

TOTALIZERS, Gas Flow
American Meter Co.
Bailey Meter Co.
Bristol Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
Penn Ind. Inst. Corp.
Republic Flow Meters
Simplex Valve & Meter

TOTALIZERS, Running Time
Aero Instrument Co.
Bristol Co.
Cramer Co., Inc.
Elec. Tachometer Corp.
Gorrell & Gorrell
Industrial Timer Corp.
Photoswitch, Inc.
Production Instrument
Standard Elec. Time
Westinghouse Elec. & Mfg.

TRAFFIC SIGNALING DEVICES (See Signaling Devices, Traffic)

TRAMMELS
Union Tool

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Allied Control
American Transformer
Freed Transformer
General Radio
Gulow Corp.
Halldorson Co.
Merit Coil & Transformer
Miller Transformer
Nothelfer Winding Labs.
Raytheon Mfg.
Sorensen & Co.
Superior Electric Co.
Thordarson Elec. Mfg.
United Transformer

TRANSFORMERS Constant Voltage
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Davis & Co.
General Controls
Miller Transformer
Sola Electric Co.
Sorensen & Co.
Standard Transformer
Superior Electric Co.
Thordarson Elec. Mfg.
United Transformer
Westinghouse Elec.

TRANSFORMERS Experimenter's Variable Voltage
Airdesign, Inc.
Allied Control Co.
American Transformer
DoAll Co.
Dongan Electric Mfg.
Freed Transformer
General Controls
General Radio Co.
Gulow Corp.
Merit Coil & Transformer
Miller Transformer
Raytheon Mfg.
Sorensen & Co.
Standard Transformer
Sorvall, Ivan
Superior Electric Co.
Thordarson Elec. Mfg.
United Transformer
Walker-Jimieson, Inc.

TRANSFORMERS, Impedance
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Merit Coil & Trans.
Miller Transformer
Sperry Gyroscope Co.
Standard Transformer
Sorenson & Co.

TRANSFORMERS, Instrument
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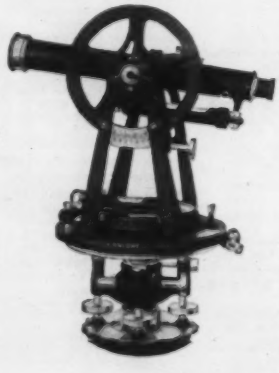
Allis-Chalmers
Amplifier Co.
Annis Co.
Assembly Products
Associated Research
Audio Development
Burlington Inst. Co.
Chicago Transformer
Columbia Elec. Mfg.
Control Corp.
Davis & Co.
Dongan Electric Mfg.
Eastern Specialty Co.
Eclipse-Pioneer Div.
Elec. Facilities, Inc.
Esterline Angus Co.
Federal Telegraph Co.
Freed Transformer
Friez Instrument
General Controls
General Elec. Co.
Gulow Corp.
Hagan Corp.
Hickok Elec. Inst. Co.
Industrial Engr. Corp.
Industrial Insts. Inc.
Kollsman Inst. Div.
Manning, Maxwell, Moore
Merit Coil & Trans.
Miller Transformer
New York Transformer
Nothelfer Winding Labs.
(Cont'd)



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Westinghouse Elec.
Weston Elec. Inst. Corp.

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Dongan Electric Mfg.
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General Controls
General Elec. Co.
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Nothelfer Winding Labs.
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Sorensen & Co.
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Miller Transformer
New York Transformer
Nothelfer Winding Labs.
Sampsel Time Control
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Sorensen & Co.
Standard Transformer
Superior Electric
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Thordarson Elec. Mfg.
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Esterline-Angus Co.
Freed Transformer
General Elec. Co.
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Islip Radio Mfg.
Roller-Smith Co.
Rubicon Co.
Sangamo Electric Co.
Sorensen & Co.
Thordarson Elec. Co.
United Transformer Corp.
Western Electro-Mech.
Westinghouse Elec.

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Dongan Electric Mfg.
Federal Telegraph Co.
Freed Transformer
General Radio Co.
Gulow Corp.
Halldorson Co.
Merit Coil & Trans.
Miller Transformer
Nothelfer Winding Labs.
Raytheon Mfg. Co.
Sorensen & Co.
Standard Transformer
Superior Electric Co.
Thordarson Elec. Mfg.
United Transformer

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Allis-Chalmers
American Transformer
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Chicago Transformer
Davis & Co., Inc., Dean
Echo Electrical
General Elec. Co.
Halldorson Co.
Miller Transformer
Sola Electric Co.
Sorensen & Co.
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Superior Electric
Thordarson Elec. Mfg.
United Transformer Corp.

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TRANSITS, Pocket
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Mico Instrument Co.
Speidel & Co.
United States Blue Print
Warren Knight Co.
White Co., Inc.

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TRUCK-TIME RECORDERS
Service Recorder Co.
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TRUCK, TIME & MILEAGE RECORDERS
Cramer & Co., Inc.
Sangamo Electric Co.
U. S. Taximeter

TUBES (See Gas & Vapor Discharge Tubes)

TUBES, Cathode Ray (See Oscillographs, Cathode Ray)

TUBES, Nessler (See Nessler Tubes)

TUBES, Oil Centrifuge (See Oil Centrifuge Tubes)

TUBES, Photoelectric
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Eby Inc.
General Electric Co.
General Scientific Corp.
RCA Div.
Vacutron, Inc.
Walker-Jimieson, Inc.

TUBES, Pitot (See Flowmeters, Pitot Tube)

TUBES, Polariscope
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Bausch & Lomb Optical
Central Scientific Co.
Fecker, J. W.
Gaertner Scientific Corp.
Heilige, Inc.
Jarrell-Ash Co.
Precision Scientific Co.
Rudolph & Sons
Sargent & Co.
Will Corporation

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TUBES, Pyrometer
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Eitzen Co.
Elematic Equip. Corp.
Engelhard, Chas.
Fish-Schurman Corp.
Foxboro Co.
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Leeds & Northrup Co.
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Taylor Instrument Cos.
Thermo-Electric Co.
Thwing-Albert Inst. Co.
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Wheatstone Corp.
Wheelco Instruments

TUBES, Spectrum (See Spectrum Tubes)

TUBES, Ultra-Violet Light (See Light Sources)

TUBES, Vacuum
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Continental Corp.
Electronic Products Co.
Electrons, Inc.
Federal Telegraph
Fredericks, George
General Elec. Co.
General Scientific Corp.
General Television Corp.
Machlett Labs.
North Amer. Philips
Raytheon Mfg. Co.
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Sorensen & Co.
Sylvania Elec. Prod.
United Electronics
Vacutron Inc.
Victoreen Instrument
Walker-Jimieson, Inc.
Western Electric
Wheelco Inst. Co.

TUBES, Venturi (See Flowmeters, Venturi)

TUBES, X-Ray
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Corning Glass Works
Eureka X-Ray Tube
Flett Lab.
General Electric X-Ray
(Cont'd)

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High Voltage Eng.
Jarrell-Ash Co.
Kelley Koett Mfg.
Machlett Labs.
North Amer. Philips
Standard Arcturus
Stoelting Co., C. H.
Universal X-Ray Prods.
Westinghouse Elec.
Westinghouse X-Ray Co.
Wyland George

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Ferguson Co.
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Parr Instrument Co.
Pfaltz & Bauer, Inc.
Photoswitch, Inc.
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Precision Scientific Co.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Zeiss, Inc., Carl

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Avion Instrument
Eclipse-Pioneer Div.
Kollsman Inst. Co.

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Marshall Co.
Michrochemical Service
Paulson & Co.

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Fuess, Inc.
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General Physical Lab.
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Universal X-Ray Prods.
Winslow Co.
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General Elec. Co.
General Television Corp.
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Precision Scientific
Stoelting Co., C. H.
Sylvania Electric Prod.
Universal X-Ray Prods.
Welch Scientific

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Bailey Meter Co.
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Ferguson Co.
Foxboro Co.
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Jerguson Gage & Valve
Lantz-Phelps Corp.
Meriam Co.
Moeller Inst. Co.
Parks Co., Harry S.
Phoenix Prec. Inst.
Pioneer Instrument
Precision Term. & Inst.
Scientific Glass Apparatus
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
Universal X-Ray Prods.
Welch Scientific

VACUUM GAGES, McLeod
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Central Scientific Co.
Distillation Products
Electronic Products Co.
Ferguson Co.
General Elec. Co.
General Physical Lab.
Macalaster Bicknell Co.
Phoenix Prec. Inst.
Scientific Glass Apparatus
Stoelting Co., C. H.
Stokes Machine Co.
Universal X-Ray Prods.
Welch Scientific

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Continental Electric
Distillation Products
Ferguson Co.
General Elec. Co.
Sylvania Elec. Prod.
General Physical Lab
Universal X-Ray Prods.
Welch Scientific
Winslow Co.

VACUUM GAGES, Thermocouple
D'Este Div.
National Research
RCA Div.
Sylvania Elec. Prod.
Universal X-Ray Prods.
Welch Scientific

VACUUM, Indicators
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Baird Associates
Bristol Co.
Brown Inst. Co.
Central Scientific Co.
Distillation Products
Foxboro Co.
Fredericks, George
General Elec. Co.
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Meriam Co.
Moeller Instrument Co.
National Research
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Rawson Electrical Inst.
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Scientific Glass App.
Skaneateles Mfg.
Star Brass Mfg. Co.
Statham Labs.
Stoelting Co., C. H.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
U. S. Gauge
Universal X-Ray Prods.

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Continental Elec. Co.
Distillation Products
Electronic Prod. Co.
Fredericks Co., Geo.
General Elec. Co.
General Physical Lab.
National Research
Shallcross Controls
Stoelting Co., C. H.
Universal X-Ray Prods.
Weksler Thermometer
Welch Mfg. Co.

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General Physical Lab.
Skaneateles Mfg.

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Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
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Distillation Products
Esterline Angus Co.
Fish-Schurman Corp.
Foxboro Co.
Frederick, George
Gotham Inst. Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
National Research
Penn Ind. Inst. Corp.
Precision Scientific
Republic Flow Meters
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Trerice Co.
Uehling Instrument Co.
Weksler Thermometer

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VACUUM TUBES (See Tubes, Vacuum)

VACUUM TUBE BRIDGES (See Bridges, Vacuum Tube)

VACUUM TUBE RELAYS (See Relays, Vacuum Tube)

VACUUM TUBE VOLT-METERS (See Voltmeters, Vacuum Tube)

VALVE BOX FINDER (See Finder, Valve Box)

VALVE-OPERATING DEVICES, Electric Motor
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Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cleveland Fuel Engr.
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Leeds & Northrup
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Robinette Co., W. C.
Ruggles-Klingemann
Shallcross Controls
Tagliabue Div.
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VALVE OPERATING DEVICES, Electric Solenoid (See Valves, Solenoid)

VALVE OPERATING DEVICES, Hydraulic (See Valves, Hydraulically Operated)

VALVE-OPERATING DEVICES, Pneumatic (See Valves, Diaphragm)

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Automatic Temp. Control
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Bendix Marine Products
Bristol Co.
Builders-Providence
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Cutler-Hammer, Inc.
Elec. Indicator Corp.
Elec. Tachometer Corp.
Fischer & Porter
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General Regulator Corp.
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Leupold & Stevens
Manning, Maxwell & Moore
Moore Products
Northern Equip. Co.
Republic Flow Meters
Tagliabue Div.
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Foxboro Co.
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Moore Products Co.
Penn Ind. Inst. Corp.
Taylor Inst. Cos.

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Automatic Switch Co.
Automatic Temp. Control
Automatic Valve Control
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Bastian-Blessing
Belfield Co.
Brown Inst. Co.
Cash Co.
Continental Equip. Co.
Davis Reg. Co.
Edison, Instrument Div.
Fisher Governor Co.
Foster Engg. Co.
Frick Co.
Friez Instrument
General Controls Co.
General Sales & Prod.
Grove Regulator
Hammel-Dahl Co.
Jerguson Gage Co.
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Leslie Co.
Manning, Maxwell & Moore
McAlear Mfg.
McDonnell & Miller
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North Amer. Mfg. Co.
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Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Smith Meter
Tagliabue Div.
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Wilgus Mfg. Co.

VALVES, Automatic Solenoid (See Valves, Solenoid)

VALVES, Balanced
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American Meter Co.
Atlas Valve Co.
Bailey Meter Co.
Baldwin Locomotive
Barber Coleman
Belfield Co.
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Schade Valve Mfg. Co.
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Spence Engineering Co.
Tagliabue Div.
Trerice Co.
Watts Regulator Co.
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Belfield Co.
Brooke Engineering
Cash Co.
Davis Reg. Co.
D'Este Division
Fisher Governor Co.
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Kiely & Mueller
Klipfel Mfg. Co.
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Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Mercon Regulator
Northern Equipment
Norwalk Valve Co.
Powers Regulator Co.
Refrigerating Spec. Co.
Reynolds Gas Regulator
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co.
Spence Engineering Co.
Tagliabue Div.
Taylor Inst. Co.
Vaughn-G. E. Witt Co.
Watts Regulator Co.
Wilgus Manufacturing

VALVES, Diaphragm
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Baldwin Locomotive
Bastian-Blessing Co.
Belfield Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Conoflow Corp.
Continental Equip. Co.
Cook Electric
Davis Reg. Co.
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D'Este Division
Eclipse-Pioneer Div.
Fischer & Porter
Fisher Governor
Foster Engg. Co.
Foxboro Co.
General Controls Co.
Gotham Inst. Co.
Hagan Corp.
Hammel-Dahl Co.
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Illinois Eng. Co.
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Kiely & Mueller
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Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell-Miller
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
North Amer. Mfg. Co.
Norwalk Valve Co.
Partlow Corp.
Payne Furnace & Supply
Powers Regulator Co.
Refrigerating Spec. Co.
Republic Flow Meters Co.
Reynolds Gas Regulator
Rockwell Mfg.
R-S Products Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Scientific Instrument Co.
Seely Inst. Co., Inc.
Spence Engineering Co.
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Valvair Corp.
Vaughn-G. E. Witt
Watts Regulator
White-Rodgers Electric
Wilgus Manufacturing
Wood, Harry W.

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Automatic Switch Co.
Automatic Temp. Control
Baldwin Locomotive
Barber-Colman
Beck Co.
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cutler-Hammer, Inc.
Davis Reg. Co.
Defender Automatic Reg.
Distillation Products
Electric Valve Mfg.
Electrimatic Corp.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Friez Instrument
General Controls Co.
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
(Cont'd)

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Magnatrol Valve Corp.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McDonnell & Miller
Midwest Airco Prods.
Minneapolis-Honeywell
North Amer. Mfg. Co.
Northern Equipment Co.
Payne Furnace & Supply
Penn Electric Switch
Perfex Corp.
Refrigerating Spec. Co.
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Shallcross Controls
Shallcross Mfg. Co.
Spence Engineering Co.
Supreme Elec. Prods.
Taco Engineering
Tagliabue Div.
Wheelco Instruments
White-Rodgers Elec. Co.

VALVES, Hydraulically Operated
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Arca Regulators, Inc.
Askania Regulator
Atlas Valve Co.
Auto. Temp. Control
Bailey Meter
Baldwin Locomotive
Barber-Coleman Co.
Belfield Co.
Cash Co.
Conoflow Corp.
Continental Equip. Co.
Controls, Inc.
Defender Automatic Reg.
Eclipse-Pioneer Div.
Fisher Governor
Ford Reg. Valve
Foster Engg. Co.
General Controls
Gen. Electric Co.
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Hunt & Son
Hydraulic Controls, Inc.
Jenkins Bros.
Johnson Service Co.
Kiely & Mueller
Leslie Co.
Leupold & Stevens
Mason-Neilan Regulator
McAlear Mfg. Div.
McDonnell & Miller
North Amer. Mfg. Co.
Positel Mfg. Co.
Powers Regulator Co.
Republic Flow Meter
Rockwell Mfg.
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co.
Schallcross Controls
Spence Engineering Co.
Sterling Eng. Co.
Sundstrand Machine Tool
Vinco Corp.

VALVES, Lubricated Plug
Acme Industrial
Belfield Co.
Industrial Filter
Parker Appliance
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Boylston Co.
Bristol Co.
Brown Instr. Co.
Brown & Sharpe
Cash Co.
Conoflow
Crosby Steam Gage Co.
Davis Reg. Co.
D'Este Division
Eclipse-Pioneer Div.
Fisher Governor Co.
Ford Reg. Valve
Foster Engg. Co.
Foxboro Co.
Frick Co.
Fulton-Sylphon
General Controls
Gotham Inst. Co.
Grove Regulator
Hagan Corp.
Hammel-Dahl Co.
Hoke, Inc.
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Natural Gas Equipment
Northern Equipment
Norwalk Valve Co.
Parker Appliance
Powers Regulator Co.
Republic Flow Meters
R-S Products Corp.
Ruggles-Klingemann
Ruska Inst. Corp.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Spence Engineering Co.
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Instr. Cos.
Trerice Co.
Vapor Recovery Systems
Vaugh-G. E. Witt Co.
Victor Equipment Co.
Watts Regulator Co.
Wilgus Manufacturing
Wood, Harry W.

VALVES, Proportional Air-Gas
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Askania Regulator Co.
Automatic Temp. Control
Barber-Colman
Black Mfg. Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Cutler-Hammer, Inc.
Fisher Governor Co.
General Controls
Hagan Corp.
Hammel-Dahl Co.
Lammert & Mann Co.
Mason-Neilan Regulator
North American Mfg.
Norwalk Valve Co.
R-S Prod. Corp.
Tagliabue Mfg. Co.
Trerice Co.

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American Meter Co.
Arco Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Automatic Valve Control
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Barber Coleman
Bastian-Blessing Co.
Belfield Co.
Boylston Co.
Boiler Room Equipment
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cash Co.
Conflow Corp.
Cook Electric
Davis Reg. Co.
Defender Automatic Reg.
D'Este Division
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Erickson Specialty
Fischer & Porter
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
Friez & Sons
Fulton Sylphon Co.
General Controls Co.
Grove Regulator
Hagan Corp.
Hammel-Dahl Co.
Hannifin Mfg. Co.
Hoke, Inc.
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
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McAlear Mfg. Div.
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Mercon Regulator
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Robertshaw Thermostat
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Ruska Inst. Corp.
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Automatic Products Co.
Automatic Switch Co.
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Belfield Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Continental Equip. Co.
Davis Reg. Co.
D'Este Co.
Eclipse Fuel Engg. Co.
Fisher Governor
Friez & Sons
Fulton Sylphon Co.
General Combustion Corp.
General Controls Co.
Grove Regulator
Hammell-Dahl Co.
Kiely & Mueller
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Magnatrol Valve Corp.
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Midwest Aircraft Prods.
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Sampsel Time Control
Schade Valve Mfg. Co.
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Sundstrand Machine Tool
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VISCOSIMETERS, Engler
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Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Kimble Glass
Precision Scientific Co.
Ruehfel Co.

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Kimble Glass
Phoenix Prec. Inst.
Precision Scientific
Tagliabue Div.

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Central Scientific Co.
Scientific Inst. Co.

VISCOSIMETERS, Hoeppler
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Esterline-Angus Co.
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Hayes Scientific App.
Norcross Corp.

VISCOSIMETERS, Redwood
American Inst. Co.
Ruehfel Co.

VISCOSIMETERS, Saybolt
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Boekel & Co.
Central Scientific Co.
Corning Glass Works
Eitzen Co.
Humboldt Mfg. Co.
Kimble Glass Co.
Monarch Mfg. Wks.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Mfg. Co.
Zuhr, Inc., Henry

VISCOMETERS, Scott
Boekel & Co.
Central Scientific Co.
Precision Scientific Co.
Ruehfel Co.
Sargent & Co.

VISCOSIMETERS, Stormer
Central Scientific Co.
Industro-Scientific Co.
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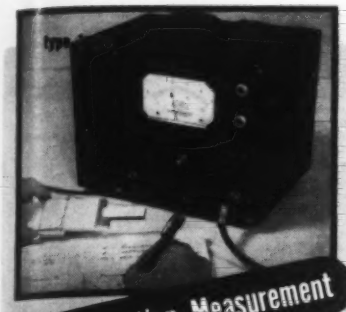

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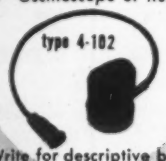

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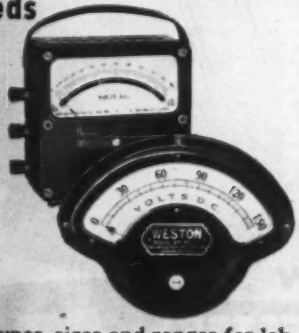

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Precision Scientific
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VOLTAGE DIVIDERS, Radio Frequency (See Dividers, Voltage)

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Ideal Commutator Dresser
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Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

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Barber Labs., Alfred
Freed Transformer
General Elec. Co.
International Resistance
Radio City Products
Rawson Elec. Inst. Co.
Reiner Electronics
Roller-Smith Co.
Rowe Radio Res.
Sensitive Research Inst.
Shallcross Mfg.
Triplett Elec. Inst.
Sherron Metallic
Westinghouse Elec.
Westinghouse X-Ray Co.
Weston Elec. Inst. Corp.

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General Elec. Co.
Industrial Insts., Inc.
International Resistance
MacLeod & Hanpol
Miller Co., Bertrand F.
Radio City Products
Raytheon Mfg. Co.
Reiner Electronics
Roller-Smith Co.
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Schweitzer & Conrad
Sensitive Research Inst.
Shallcross Mfg. Co.
Sheron Metallic
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Meters, Inc.
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Rawson Electrical Inst.
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Reliance Instrument Co.
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Sensitive Research Inst.
Simpson Electric Co.
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Supreme Instruments
Triplett Electrical Inst.
U. S. Gauge
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.

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General Electric Co.
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General Elec. Co.
Landis & Gyr, Inc.
Sensitive Research Inst.
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Electronic Development
General Radio Co.
Hewlett-Packard
Marion Electrical Inst.
M-B Instruments, Inc.
Meters, Inc.
Simpson Electric Co.
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Geophysical Instrument Co.
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Reliance Instrument Co.
Roller-Smith Co.
Triplett Elec. Inst.
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VOLTMETERS, Electrostatic
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Ferranti Electric, Inc.
General Elec. Co.
Hathaway Inst. Co.
Hickok Elect. Inst. Co.
Rawson Electrical Inst.
Sensitive Research Inst.
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Boes Co., W. W.
Burlington Inst. Co.
Burton-Rogers Co.
Chicago Indust. Inst.
Clough-Brengle Co.
Columbia Elec. Mfg.
Control Corp.
Dale Instruments
Dayton Acme Co.
De Jur-Amsco Corp.
Electronic Development
Espey Mfg.
Ferranti Electric Inc.
General Elec. Co.
Hickok Elec. Inst. Co.
J-B-T Insts.
Marion Electrical Inst.
M-B Instruments
Meters, Inc.
Niagara Electrical Inst.
Norton Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Reiner Electronics
Reliance Instrument
Roller-Smith Co.
Sensitive Research Inst.
Shelby Inst.
Simpson Elec. Co.
Sticht Co.
Sun Electric Corp.
Taco West Corp.
Triplett Elec. Inst.
Triumph Mfg. Co.
U. S. Gauge
Welch Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

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Measurements Corp.
National Tech. Labs.
Rawson Elec. Inst.
Roller-Smith Co.
Sensitive Research Inst.
Welch Scientific

VOLTMETERS, Megohm
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Dale Instruments
Daven Co.
Deimhorst Instrument
Electro Products Lab.
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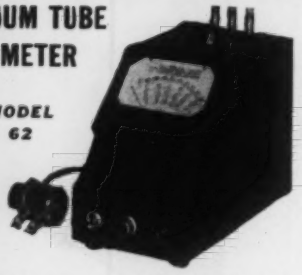

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Dale Instruments
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Hickok Elec. Inst. Co.
Microvolts, Inc.
Rawson Electrical Inst.
Sensitive Research Inst.
Supreme Instruments
Televiso Co.
Triplett Elec. Inst.
Welch Scientific
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Burlington Inst. Co.
Clarke Inst. Corp.
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Rollin Co.
Sensitive Research Inst.
Triplett Elec. Inst.

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Bristol Co.
Brown Inst. Co.
Burlington Inst. Co.
Burton Rogers Co.
Cambridge Inst. Co.
Commercial Research
Dale Instruments
Dayton Acme Co.
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Electronic Development
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National Tech. Labs.
Prec. Apparatus Co.
Roller-Smith Co.
Welch Scientific
Westinghouse Elec.

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Electronic Dev. Lab.
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General Radio Co.
Hickok Elec. Inst. Co.
Marion Electrical Inst.
M B Mfg. Co.
Meters, Inc.
Radio City Products Co.
Reiner Electronics
Roller-Smith Co.
Simpson Elec. Co.
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Engelhard, Chas.
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Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.
Vibrotest insulation testing equipment. Special measuring & testing instruments of electrical nature.
(See advertisements on pages 48, 87, 106)

Atlas Electric Devices Co., 361 West Superior St., Chicago 10, Ill.
Fade-Ometer, Weather-Ometer, Launder-Ometer
(See advertisement on page 89)

Atlas Valve Co., 282 South St., Newark 5, N. J.
Regulator valves

Atomic Instrument Co., 160 Charles St., Boston, Mass.
Radioactive detectors and electronic instruments

Audio Development Co., 2833 13th Ave., Minneapolis 7, Minn.
Transformers, audio frequency equipment

Audio-Tone Oscillator Co., 237 John St., Bridgeport 3, Conn.
Radio Test Instruments

Auth Electrical Specialty Co., Inc., 422 E. 53 St., New York 22, N. Y.
Signaling devices

Autocall Co., Shelby, Ohio
Electrical signaling, control & metering devices

Autoflight Insts. Div., G. M. Giannini & Co., 285 W. Colorado St., Pasadena 1, Calif.
Aircraft instruments
(See advertisement on page 79)

Automatic Control Co., 1005 University Ave., St. Paul 4, Minn.
Circuit switches for automatic level controls, automatic timing & sequence controllers

Automatic Electric Mfg. Co., Mankato, Minn.
Time switches & interval timers

Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, Ill.
Telephone, signaling & communication apparatus

Automatic Scale Co., Inc., 791 Hudson St., New York 14, N. Y.
Automatic scales

Automatic Switch Co., 41 East 11th St., New York 3, N. Y.
Solenoid operated valves & automatic electric control apparatus

Automatic Temperature Control Co., Inc., Logan St. & Germantown Ave., Philadelphia 44, Pa.
Timers, time control and specialty engineering. Valves & valve controllers, various types of relays.
(See advertisement on page 100)

Automatic Time Stamp Co., 370 Atlantic Ave., Boston 10, Mass.
Time stamps & job recorders

Automatic Valve Controller Co., Box 268, Tulsa 1, Okla.
Automatic valve control.

Autotron Co., Danville, Ill.
Automatic inspection devices

Avion Instrument Co., 15 Moore St., New York, N. Y.
Aviation instruments

B

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8, Pa.
Industrial instruments
(See advertisement on page 45)

Badger Meter Mfg. Co., 2371 North 30th St., Milwaukee 10, Wis.
Liquid meters

Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio
Metering & control equipment for power plants & industrial processes. Power plant instruments; boiler meter, meter combustion control operating directly from boiler meter, three-element feed water control, steam superheat control, desuperheating & pressure reducing control. Also metering & control equipment for sewage treatment, water supply & process industries
(See advertisements on pages 19, 25, 26, 28, 29, 40, 54, 71)

Baily Vibrator Company, 1539 Wood St., Philadelphia 2, Pa.
Optical glass machines, grinding & polishing machines for optical glass

Baird Associates, 33 University Road, Cambridge 38, Mass.
Specialized physical & optical instruments including complete line of spectrographic & x-ray diffraction equipment

Baker Compass Co., Melrose, Mass.
Compasses

Baldwin Locomotive Works, Eddystone, Pa.
Universal testing machines
(See advertisement on page 42)

Ballantine Labs., Inc., Boonton, N. J.
Artificial ears, electronic voltmeters, sound meters, vibration pickups, throat microphone, telephone receiver test equipment
(See advertisement on page 107)

Ballauf Mfg. Co., D., 621 H St., N. W. Washington 1, D. C.
Meteorological instruments

Bar-Ray Products, Inc., 209 25th St., Brooklyn, N. Y.
X-ray equipment

Barber-Colman Co., Rockford, Ill.
Automatic controlling instruments for temperature, humidity, pressure, liquid level, moisture regain, motor-operated valves, solenoid valves, electric power units, damper controllers, voltage sensitive relays, associated switches & relays, fractional H. P. motors, geared motor units & hardness testers.

Barber Laboratories, Alferd W., 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.
Voltmeters

Barbour Stockwell Co., 205 Broadway, Cambridge, Mass.
Tachometers

Bank's Mfg. Co., 939 Wilson Ave., Chicago 40, Ill.
Amplifiers and intercommunication equipment

Barker Tool, Die & Gauge Co., 5529 Elery St., Detroit 11, Mich.
Gages for linear measurements made to customer's specifications

Barnstead Still & Sterilizer Co., Inc., 2 Lanesville Terrace, Boston 31, Mass.
Water stills

Bartelt Engineering Co., 1214 Partridge Ave., Beloit, Wis.
Pedestal micrometers

Barton Instrument Co., 3500 Union Pacific Ave., Los Angeles 23, Calif.
Flowmeters & gages
(See advertisement on page 69)

Bastian-Blessing Co., 4201 W. Peterson St., Chicago 30, Ill.
Regulating valves

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.
Optical instruments for industrial, scientific & educational use including microscopes, colorimeters, refractometers, photomicrographic & metallographic equipment, contour measuring projector, optical glass & special optical systems

Beacon Gage Co., 11 River St., Wellesley, Mass.
Pressure gages

Bear Manufacturing Co., Rock Island, Ill.
Balancing machines

Beck Bros., 421 Sedgley Ave., Philadelphia 40, Pa.
Resistors

Beck Co., Harold, 3642 N. Second St., Philadelphia 40, Pa.
Pyrometer controllers
(See advertisement on page 26)

Becker, Inc., Christian, 92 Reade St., New York 13, N. Y.
Precision balances & weights, including analytical, assay, magnetically damped, diamond, specific gravity, dairy, druggists, text le.

Beckman Co., L., 1609 Canton St., Toledo 2, Ohio
Surveying instruments

Belfield Co., H., Broad & Hamilton Sts., Philadelphia 23, Pa.
Valves
(See advertisement on page 104)

Bell & Howell Co., 7100 McCormick Rd., Chicago 45, Ill.
Motion picture equipment including cameras, projectors & accessories

Bendix Aviation Corp., Marine Division, 754 Lexington Ave., Brooklyn, N. Y.
Marine Instruments of all types, annunciators, Autosyn motor ship, telegraphs, marine fittings, marine telephone equipment, general industrial safety & signaling equipment

Benwood Linze Co., 1811 Locust St., St. Louis 3, Mo.
Rectifier power units

Berge, J. & H., 145 Hudson St., New York 13, N. Y.
Laboratory supplies

Berger & Sons, Inc., C. L., 37 Williams St., Roxbury, Boston 19, Mass.
Surveying instruments

Berkeley Scientific Co., 601 Nevin Ave., Richmond, Calif.
Radioactivity measurement instruments, & spectrometers

Best Scientific Glass App. Wks., 2449 N. Clybourn St., Chicago 14, Ill.

Betts and Betts Corp., 551 West 52nd St., New York 19, N. Y.
Multiple circuit timers, controls, time delay relays & motor driven & thermostatic interrupters

Biddle Co., James G., 1316 Arch St., Philadelphia, Pa.
Insulation testers, ground testers & ohmmeters, speed-measuring instruments, frequency meters, sliding-contact rheostats
(See advertisement on page 53)

Bin-Dicator Co., 14615 East Jefferson Ave., Detroit 15, Mich.
Automatic bin level indication & control

Binswanger & Co., 645-655 Union Ave., Memphis 1, Tenn.
Lenses, prisms & filters. Glass of every description

Biological Supply Co., 1176 Mount Hope Ave., Rochester 7, N. Y.
Biological supplies

Bird Electronic Corp., 1800 E. 38th St., Cleveland 14, Ohio
Switches, wattmeters

Black & Decker Mfg. Co., 715 Pennsylvania Ave., Towson, Md.
Truck scales

Black Mfg. Co., 1416 W. Baltimore St., Baltimore 23, Md.
Automatic pressure & flow controllers, pressure gages, aircraft oxygen regulators

Black & Webster, Inc., 126 Massachusetts Ave., Boston, Mass.
Pellet presses, time study apparatus

Bliley Electric Co., 200 Union Station Bldg., Erie, Pa.
Quartz piezo-electric crystals

Bliss & Co., Inc., John, 84 Pearl St., New York 4, N. Y.
Marine instruments

Bock Machine Co., 3618 Colerain Ave., Cincinnati 23, Ohio
Erichsen sheet metal testing machine

Bodine Electric Co., 2254 W. Ohio St., Chicago 12, Ill.
Motors, all types of windings from 1/2000 to 1/6 hp, speed reducer & nonreducer motors

Boehmke Optical Co., 3737 Bird Road, Miami 33, Fla.
Precision optical manufacturers

Boekel & Co., Wm., 509-519 Vine St., Philadelphia 6, Pa.
Laboratory apparatus

Boes Co., 1059 S. Patterson Blvd., Dayton 2, Ohio
Electrical & navigational instruments for aircraft

Boiler Room Equipment, Inc, 45 West 45th St., New York, N. Y.
Smoke alarms

Boonton Radio Corp., P. O. Box 390, Boonton, N. J.
Radio test instruments

Booth Co., A. E., 210 W. 7th St., Los Angeles 14, Calif.
Portable meter testers

Borden Electric Co., Summit, N. J.
Ground resistance meters

Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Liquid level gages and allied lines

Bostrom-Brady Mfg. Co., Stonewall & Bailey Sts., Atlanta, Ga.
Surveying instruments

Boulin Instrument Corp., 65 Madison Ave., New York 16, N. Y.
Chronometric hand tachometers, wound stroboscopes, electrical stroboscope, speed indicators & portable & stationary tachometers
(See advertisement on page 86)

Bowen & Co., Inc., 4712 Bethesda Ave., Bethesda 14, Md.
Cement testers

Bowser & Co., Inc., S. F., 1302 E. Creighton Ave., Fort Wayne 2, Ind.
Liquid meters

Bowser, Inc. Refrigeration Div., Terryville, Conn.
Testing cabinets, low temperature, high [illegible] relative humidity

Boyer-Campbell Co., 6540 Antoine St., Detroit 2, Mich.
Magnifiers

Boylston Steam Specialty Co., 116 W. Illinois St., Chicago 10, Ill.
Regulating valves

Brabender Corp., 244 Saddle River Rd., [illegible] Park, N. J.
Industrial measuring & control apparatus for plastic & viscous materials; semi-automatic moisture testers

Bradley Laboratories, Inc., 82 Meadow St., New Haven 10, Conn.
Photoelectric cells
(See advertisement on page 75)

Brady Co., W. H., 802 N. Third St., Milwaukee 2, Wis.
Wire markers

Branson Instruments, Inc., Joe's Hill Rd., Danbury, Conn.
Thickness gages, tube & sheet metal

Braun Corp., 2260 East 15th St., Los Angeles 21, Calif.
Chemicals & laboratory supplies

Braun-Knecht-Heimann Co., 576 Mission St., San Francisco 19, Calif.
Laboratory supplies

Bray Optical Co., 3445 W. 1st St., Los Angeles 4, Calif.
Lenses, prisms & optical instruments

Breeze Corporation, 24 South 6 St., Newark 7, N. J.
Multiple connectors; radio ignition shielding

Bridgeport Thermostat Co., Inc., Bridgeport 1, Conn.
Metallic bellows and thermostats

Brigham Co., R. B., 624 Southard Ave., Toledo 2, Ohio
Photoelectric controls

Bristol Company, Waterbury 91, Conn.
Recording & automatic controlling instruments for pressure, vacuum, draft, absolute pressure, humidity, liquid level, flow, pH value, temperature (pyrometers & thermometers) & speed. Included are recording barometers, voltmeters, ammeters, wattmeters, dairy instruments, machine operation, motion & operation recorders, control valves, telemetering instruments, process cycle controllers, coordinated process control, time-temperature & time-pressure controllers, potentiometers, air operated & electric controllers & thermal converters. Variations & combinations of these instrumentss are offered for applications in the various industries & processes. Dilatometers & combustible gas & vapor detectors.
(See advertisements on pages 24, 40, 48, 71, 79, 97)

Brodie Co., Inc., Ralph N., 61st & Lowell Sts., Oakland 8, Calif.
Positive displacement petroleum meters & accessories

Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia 44, Pa.
Electrically actuated pressure & flow controllers

Brookfield Engineering Laboratories, Sharon, Mass.
Synchro-lectric viscosimeter
(See advertisement on page 105)

Brooks Rotameter Co., Box B-511, Lansdale, Pa.
Flowmeters

Brown Geophysical Co., P. O. Box 6005, Houston 6, Tex.
Instruments for measuring earth's gravitational field

Brown Instrument Company, 4482 Wayne Ave., Philadelphia 44, Pa.
Thermocouple & optical pyrometers, resistance thermometers, pressure thermometers, pressure gages, flow meters, liquid level gages, hygrometers, CO_2 meters, control systems; electric, air-operated & combined electric & air-operated; combustion safety controls, moisture content recorder & controller & furnace atmosphere recorder
(See advertisements on pages 23, 25, 34, 36, 57, 66, 68, 69, 77, 92, 94)

Brown & Sharpe Mfg. Co., Providence 1, R. I.
Machine shop instruments

Brownell, H. Russell, 188 West 4 St., New York 14, N. Y.
Electrical Instruments

Browning Laboratories, Inc., 750 Main St., Winchester, Mass.
Frequency meters, signal generators, cathode-ray oscillographs
(See advertisement on page 61)

Bruning Co., Inc., Chas., 4754 Montrose St., Chicago 41, Ill.
Drawing & surveying instruments

Brush Development Co., 3311 Perkins Ave., Cleveland 14, Ohio
Piezoelectric instruments including laboratory microphones, vibration & fluid pulsation pickups, galvanometers, pen oscillographs, surface finish testers, artificial ears, headphones, phonograph pickups & cutters

Bryant Chucking Grinder Co., Springfield, Vt.
Screw thread gages

Buchele Optical Co., Wm., 1309-11 Milburn Ave., Toledo 6, Ohio
Optical parts

Buffalo Apparatus Corp., 90 Shenango St., Buffalo 15, N. Y.
Laboratory supplies

Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y.
Liquid meters for measurement of cold water, hot water, oils, chemicals. Integrating registers, cumulative, setback, or predetermined control.
(See advertisement on page 54)

CAMBRIDGE INSTRUMENTS

FOR EXACTING PROFESSIONS AND INDUSTRIES

VIBROGRAPHS, FLUXMETERS, GEOPHYSICAL SEISMOGRAPHS, AERO MIXTURE INDICATORS, EXHAUST GAS TESTERS, ELECTROMETERS, GALVANOMETERS, ELECTROCARDIOGRAPHS, GAS ANALYSIS EQUIPMENT, and many other MECHANICAL AND ELECTRICAL INSTRUMENTS OF PRECISION for use in science, medicine and industry.

Cambridge invites your inquiries on any special instrument problems you may have.

Pioneer Manufacturers of Precision Instruments

CAMBRIDGE INSTRUMENT COMPANY, INC. 3742 GRAND CENTRAL TERMINAL NEW YORK 17, N. Y.

Buffalo Scale Co., 1200 Niagara St., Buffalo 13, N. Y.
Scales

Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.
Instruments for indicating, recording, controlling flow, liquid level, pressure, temperature, and weight

Bullard Co., E. D., 275 Eighth St., San Francisco 3, Calif.
Gas leak detectors

Bunnell & Company, J. H., 81 Prospect St., Brooklyn, N. Y.
Relays & switches

Burgess Battery Co., Freeport, Ill.
Dry batteries

(See advertisement on page 18)

Burke Electric Co., Erie, Pa.
Fractional horsepower motors

Burke & James, Inc., 321 S. Wabash, Chicago 4, Ill.
Photographic equipment for research and laboratory departments

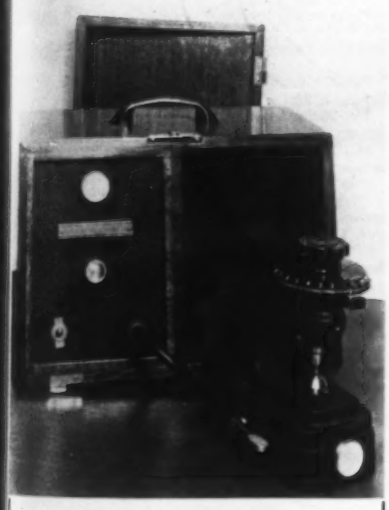
(See advertisement on page 21)

Burke, Louis, 41 John St., New York, N. Y.
Stop watches and chronometers

Burling Instrument Co., 251-253 Springfield Ave., Newark 3, N. J.
Temperature controls for laboratories, Industrial processes, furnaces & ovens. (-100° to 1400°F.) Standard tubes or special alloys & ranges.

(See advertisement on page 28)

Burlington Instrument Co., 214½ North 4th St., Burlington, Iowa
Electrical control apparatus



MODEL M CARSON ELECTRONIC MICROMETER

Measures to .000025 in.

Fine wire, plastic filaments, capacitor paper, rubber sheet, aluminum foil, acetate sheet enameled wire, cork, impregnated fabric, photographic emulsions, paint films, die test wire.

Write for catalogue No. 2A

CARSON MICROMETER CORP.
LITTLE FALLS, NEW JERSEY

Burrell Technical Supply Co., 1942 Fifth Ave., Pittsburgh 19, Pa.
Scientific instruments & laboratory supplies

Burton Mfg. Co., 3853 N. Lincoln St., Chicago 13, Ill.
Microscopic accessories & bank & turn indicators

Burton-Rogers Co., 857 Boylston St., Boston 16, Mass.
Electrical instruments

B. W. Controller Corp., 2200 E. Maple Rd., Birmingham, Mich.
Floatless liquid level controls

C

Cady & Co., E. J., 549 W. Washington Blvd., Chicago 6, Ill.
Non destructive testers for physical properties

Calculagraph Co., 300 Sussex St., Harrison, N. J.
Elapsed time indicator

Calibron Products, Inc., 51 Lakeside Ave., West Orange, N. J.
Special apparatus

Callahan & Co., E. J., 14 W. Barre St., Baltimore 1, Md.
Laboratory supply house

Calta Glass Wks., 2158 Ogden Ave., Chicago 12, Ill.
Scientific glassware

Cambridge Instrument Co., Inc., Grand Central Terminal, New York 17, N. Y.
Scientific & industrial instruments

(See advertisements on pages 45, 46, 49, 56, 66, 71, 111)

Cameron Surgical Specialty Co., 666 W. Division St., Chicago 10, Ill.
Surgical instruments

Campbell Co., J. A., 645 E. Wardlow Rd., Long Beach 7, Calif.
Thermometer wells & automatic controllers

Canadian Radium & Uranium Corp., 630 Fifth Ave., New York 20, N. Y.
Luminous, phosphorescent and fluorescent paints

Cannon Electric Development Co., 3209 Humbolt St., Los Angeles 31, Calif.
Multiple circuit connectors for instruments

Cardwell Mfg. Corp., Allen D., 81 Prospect St., Brooklyn 1, N. Y.
Variable & fixed air condensers

Cargille, R. P., 118 Liberty St., New York 6, N. Y.
Chemical laboratory & photographic devices. Immersion liquids for inspecting glass & quartz

Carson Micrometer Corp., Little Falls, N. J.
Electronic micrometer

(See advertisement on page 111)

Carter Radio Div., Precision Parts Co., 213 Institute Place, Chicago 10, Ill.
Relays, resistors, rheostats & switches

Cash Company, A. W., P. O. Box 575, Decatur B, Ill.
Combustion control instruments

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Scientific instruments & laboratory apparatus

(See advertisement on page 16)

Central Station Steam Co., 2910 E. Woodbridge St., Detroit 7, Mich.
Rotary type condensate meter

Centralab Div., Globe Union Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.
Capacitors, rheostats, resistors & switches

Century Geophysical Corp., 1333 N. Utica Ave., Tulsa 6, Okla.
Geophysical instruments

Chace Co., W. M., 1600 Beard Ave., Detroit 9, Mich.
Thermostatic bimetals

Chart Production Co., 280 Madison Ave., New York 16, N. Y.
Charts for all types of recording

(See advertisement on page 111)

Charvos-Roos Corp., 101 5th Ave., New York 3, N. Y.
Drawing instruments

Chaslyn Co., 1952 Irving Park Rd., Chicago 13, Ill.
Storage battery testers

Chatillon & Sons, John, 85 Cliff St., New York 7, N. Y.
Iso-elastic springs

(See advertisement on page 33)

Chelsea Clock Company, Boston 3, Mass.
Clocks & clock movements

Chemical Rubber Co., 2310 Superior, East, Cleveland 14, Ohio
Laboratory supplies

Chicago Apparatus Co., 1735 No. Ashland Ave., Chicago 22, Ill.
Laboratory supplies

Chicago Dial Indicator Co., 180 N. Wacker Dr., Chicago 6, Ill.
Machinist's dial indicators

Chicago Electric Tachometer Co., 800 N. Clark St., Chicago 10, Ill.
Tachometers

Chicago Industrial Inst. Co., 219 W. Chicago Ave., Chicago 10, Ill.
Radio, electronic & industrial test equipment

Chicago Metal Hose Corp., 1309 3rd Ave., Maywood, Ill.
Metal bellows

Chicago Surgical & Electrical Co., 324 W. Superior St., Chicago 10, Ill.
Laboratory supplies

Chicago Transformer Div., Essex Wire Corp., 3501 W. Addison St., Chicago 18, Ill.
Instrument & power transformers

Cincinnati Clock & Instrument Co., 1113 York St., Cincinnati 14, Ohio.
Circuit breaker analyzer

Cincinnati Scientific Co., 224 Main St., Cincinnati 2, Ohio
Laboratory supplies

Two Color Co-ordinate Paper

for

Research and Engineering Records

Designed for Reproduction Work in which the light blue intermediate lines disappear — only the major red dimensional lines reproduce.

Of service for every purpose where a co-ordinate paper is wanted.

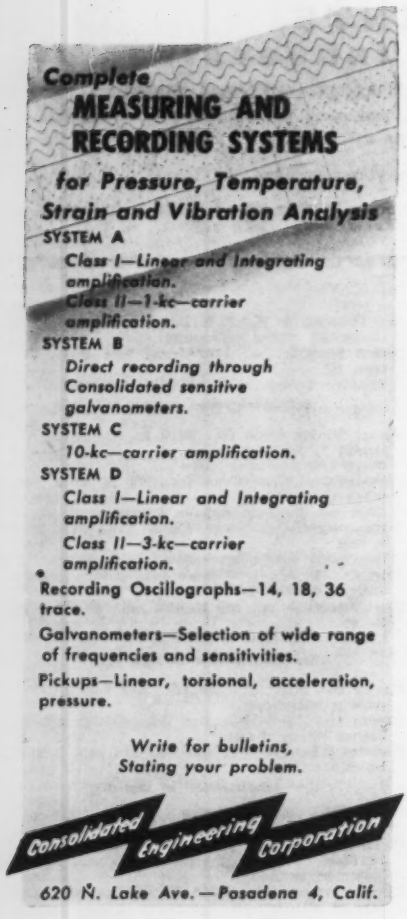
A second Color in Graphs adds Clarity and Appeal

Sheets 8½x11 and 11x16½ inches. Sold in 100 sheet units.

Samples and Prices on Request

Chart Production Company

278 Madison Ave. New York 16, N.Y.



Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati 14, Ohio
Time recorders

Claflin Co., Geo. L., 150 Dorrance St., Providence 3, R. I.
Laboratory supply house

Clare & Co., C. P., 4719 Sunnyside Ave., Jefferson Sta., Chicago, Ill.
Relays, electric counters & electro mechanical specialties

Clark Blast Meter Co., Chas. J., Gladbrook, Iowa
Foundry blast meters & pressure gages

Clark Instrument Co., Inc., 10202 Ford Road, Dearborn, Mich.
Hardness testers
(See advertisement on page 87)

Clark & Sons, Inc., Alvan, 58 Day St., West Somerville, Mass.
Optical & astronomical instruments

Clarke Instrument Corp., 910 Jackson St., Silver Spring, Md.
Electrical indicating instruments and accessories

Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn 11, N. Y.
Resistors

Clay-Adams Co., Inc., 44 E. 23 St., New York 10, N. Y.
Angle & micro centrifuges, compact balances, analytical weights, microscope slides & cover glasses, glass & porcelain ink, tuning forks

Clebar Watch Co., 551 Fifth Ave., New York 17, N. Y.
Stop watches, timers & chronographs
(See advertisement on page 108)

Cleveland Fuel Engineering Co., 606 Williamson Bldg., Cleveland, Ohio
Furnace controllers, pyrometers & gages

Clifford Mfg. Co., 584 E. First St., Boston 27, Mass.
Metallic bellows & diaphragms; thermostatic assemblies; packless valves

Clippard Instrument Laboratory, Inc., 1125 Bank St., Cincinnati 14, Ohio
Electronic apparatus and electrical instruments

Clough-Brengle Co., 6014 Broadway, Chicago 40, Ill.
Electrical instruments, communication testing instruments

Coats Machine Tool Co., Inc., 17 Tudor Lane, Scarsdale, N. Y.
Spring testers

Cole Co., H., 82 North High St., Columbus 15, Ohio
Surveying instruments

Coleman Electric Co., Inc., 318 Madison St., Maywood, Ill.
Electrical measuring instruments for technical applications

Coleman Instrument & Mfg. Co., 716 S. Troost Ave., Tulsa 5, Okla.
Oscillographs

Collins Radio Co., Cedar Rapids, Iowa
Electronic apparatus

Colloid Equipment Co., Inc., 50 Church St., New York 7, N. Y.
Laboratory apparatus

Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, Ohio
Rheostats, instruments, shunts, switchboards & special electrical equipment

Combustion Control Corp., 77 Broadway, Cambridge, Mass.
Combustion controls

Commerce Pattern Foundry & Machine Co., 7450 Melville Ave., Detroit 17, Mich.
Balancing machines

Commercial Research Labs., Inc., 20 Bartlett Ave., Detroit 3, Mich.
Laboratory instruments for automotive, aircraft, railway & allied industries; air flow indicators, direct pressure & piezo-ray engine indicators, fuel flow indicators, magnetic gages, torsional vibration indicators (piezo-ray), recorders (torsiographs) & recording instruments for car performance & riding comfort.

Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.
Testers, rectifiers, voltage regulators, communication measuring equipment

Compar Instrument Co., 16179 Hamilton Ave., Detroit 3, Mich.
Comparoscope

Comtor Company, 83 Rumford Ave., Waltham 54, Mass.
Precision internal & external comparator-type diameter gages

Conant Electrical Laboratories, 6500 O St., Lincoln 5, Neb.
Dry disc rectifiers

Concord Radio Corp., 901 W. Jackson Blvd., Chicago 7, Ill.
Amplifiers
(See advertisement on page 55)

Connecticut Telephone & Electric Div., Great American Industries, Inc., Meriden, Connecticut
Electronic devices

Connelly Inc., 3154 S. California Ave., Chicago 8, Ill.
Gages & manometers, B T U indicator & H_2S tester

Conoflow Corp., 2100 Arch St., Philadelphia 3, Pa.
Valves, automatic controls
(See advertisement on page 76)

Consolidated Engineering Corp., 620 N. Lake Ave., Pasadena 4, Calif.
Geophysical instruments, mass spectrometers, vibration measuring equipment
(See advertisements on pages 60, 69, 105, 112)

Consulting & Engineering Co., 130 Bradford St., Pittsburgh 5, Pa.
Combustion controllers

Continental Corp., 1800 Winnemac Ave., Chicago 4, Ill.
Vacum tubes

Continental Electric Co., Geneva, Ill.
Photoelectric tubes & equipment

Continental Equipment Co., Coraopolis, Pa.
Valves

Control Corporation, 718 Central Ave., Minneapolis 14, Minn.
Automatic & remote control equipment

Controls, Inc., Towaco, N. J.
Control valves; motor driven time delay relays; process timing devices

Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill., Research Div., 1457 Diversey Pky., Chicago 14, Ill.
Electrical control devices, metal bellows, vapor motors & telephone protective & distributing apparatus aircraft instrumentation, relays, pressure switches

Cook Research Laboratories, L. H., Box 696, Menlo Park, California
Precision testing instruments for oil industry, oil well cement testing equipment, combustible gas indicators, depth pressure recorders

Coors Porcelain Co., Golden, Colo.
Chemical & scientific porcelain

Corbin Screw Div., American Hardware Corp., New Britain, Conn.
Tachometers & speedometers
(See advertisement on page 85)

Cornell-Dubilier Electric Corp., So. Plainfield, New Jersey
Mica, dykanol, paper & wet & dry electrolytic capacitors

Corning Glass Works, Corning, N. Y.
Technical glassware

Counter and Control Corp., 2737 S. 28 St., Milwaukee 7, Wis.
Counters

Cramer Co., Inc., R. W. Centerbrook, Conn.
Interval timers, running time meters, time switches, signal control switches, time delay switches
(See advertisement on page 99)

Crosby Steam Gage & Valve Co., 10 Roland St., Charlestown, Mass.
Safety & relief valves, gages, recorders, testers & steam engine indicators

Crystal Research Labs., Inc., 29 Allyn St., Hartford 3, Conn.
Capacitors, quartz products, filters, flat[illegible] frequency meters, signal generators, mirrors, oscil[illegible]rs, rf oscillators, vitreous silica, time interval [illegible]parator, vibration pickups

Curtin & Co., W. H., P. O. Box 118, Hous[illegible], Tex.
Laboratory supplies

Curtis Development & Mfg. Co., 1 N. Cra[illegible]ord Ave., Chicago 24, Ill.
Thermostats

Cuthbert Co., Inc., 322 South Third St., [illegible]neapolis 15, Minn.
Scientific grain, seed and food testing equ[illegible]ment

Cutler-Hammer, Inc., 315 North 12th St., [illegible]Milwaukee 1, Wis.
Electric motor control, safety switches, m[illegible]tor driven valve operators, gas calorimeters, gas mixing & st[illegible]bilizing control, resistors

Cyclone Motor Corp., 5-17 46th Rd., Long Island City, N. Y.
Fractional-horsepower motors

Cyclotron Specialties Co., Morago 6, Calif.
Radioactivity equipment

D

Daigger & Co., A., 159 W. Winzie St., Chicago 10, Ill.
Laboratory supplies

Daven Co., 191 Central Ave., Newark 4, N. J.
Attenuators, calibrating equipment for electrical instruments & resistors

Davis & Co., Inc., Dean W., Kentland, Ind.
Solenoids & transformers

Davis Emergency Equipment Co., Inc., 80 Halleck St., Newark 4, N. J.
Inflammable gas alarms
(See advertisement on page 44)

Davis Regulator Co., 2541 So. Washtenaw Ave., Pilsen Sta., Chicago 8, Ill.
Valves

Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Chromium plated gage blocks

Dearborn Scientific Co., 1228 W. Kinzie St., Chicago 22, Ill.
Optical flats

Defender Automatic Regulator Co., 308 S. 8th St., St. Louis 2, Mo.
Industrial instruments

De Juhasz, K. J., 730 N. Atherton St., State College, Pa.
Engine indicators and indicator valves

De Jur-Amsco Corp., Northern Blvd. at 45th St., Long Island City 1, N. Y.
Photoelectric exposure meters, electrical, radio & photographic products

Delmhorst Instrument Co., 115 Cornelia St., Boonton, N. J.
Moisture detectors

Deming Indicator Co., 36 E. 1st St., Dayton 2, Ohio
Test indicators & dial indicators

Demuth Glass Works, Inc., Wythe Ave. at N. 11th St., Brooklyn 11, N. Y.

Denison Engineering Co., 1160 Dublin Rd., Columbus, Ohio
Presses

Denominator Co., Inc., 261 Broadway, New York 7, N. Y.
Group counting machines

Denver Fire Clay Co., P. O. Box 5510, Denver 17, Col.
Specialized industrial control equipment for power plant & processing industries, laboratory specialties

D'Este Div., American Chain & Cable Co., Reading, Pa.
Control valves, regulators, etc.

Detecto Scales, Inc., see Jacobs Bros. Co., Inc.

Detroit Air Meter Co., P. O. Box 1473, Detroit 31, Mich.
Air flowmeters

Detroit Lubricator Co., 5900 Trumbull Ave., Detroit, Mich.
Automatic controls & equipment for air conditioning

Detroit Tap & Tool Co., 8434 Butler St., Detroit 11, Mich.
Machinists' gages

Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13, Mich.
Testing machines

Deutschmann Corp., Tobe, Canton, Mass.
Equipment for locating, eliminating, and measuring radio noise; electrolytic, paper dielectric & oil type capacitors

De Vry Corporation, 1111 Armitage Ave., Chicago 14, Ill.
Scientific motion picture equipment & slide projectors

Dial Light Co. of America, Inc., 900 Broadway, New York 3, N. Y.
Dial lights

Dickson Co., 7420 Woodlawn Ave., Chicago 19, Ill.
Furnace controls

Dietert Co., Harry W., 9330 Roselawn Ave., Detroit 4, Mich.
Sand testing equipment; immersion pyrometers, moisture testers, accessories for spectrographic laboratories

Dietzgen Co., Eugene, 2425 Sheffield Ave., Chicago 14, Ill.
Drafting & surveying instruments

Pfau & Co., Inc., W. C., 5410 W. Harrison St., Chicago 44, Ill.
Traction dynamometers, tensile machines, thermometers

(See advertisements on pages 15, 90)

Distillation Products, Inc., 755 Ridge Road West, Rochester 13, N. Y.
High vacuum pumps, low vapor pressure fluids & auxiliary equipment

Doall Company, 254 N. Laurel, Des Plaines, Ill.
Gages, Brinell hardness testers, precision tools

Dodeam, Inc., 437 Cherry St., West Newton 65, Mass.
Aircraft navigational instruments

Doerr Glass Co., Inc., 500 Peach St., Vineland, N. J.
Chemical glassware

Dome Precision Corp., 21 North 11 St., Brooklyn 11, N. Y.
Optical instruments

Dongan Electric Mfg. Co., 2987 Franklin St., Detroit 7, Mich.
Transformers

Doolittle Radio, Inc., 7421 Loomis Blvd., Chicago 36, Ill.
Frequency monitor

Dorr-Patterson Engineering Co., 3362 Wight Ave., Detroit 7, Mich.
Physical testing machines

Douglass Automatic Controls Co., 4505 E. Firestone Blvd., South Gate, Calif.
Boiler controls

Douthitt Corp., 650 W. Baltimore Ave., Detroit 2, Mich.
Process cameras & diaphragm control for cameras

Dow Corning Corp., Midland, Mich.
Silicone fluids and greases for high and low temperature lubrication of instruments, stop-cock grease, high vacuum grease, lens cement, liquid dielectrics, diffusion pump oils

Drafto Co., Cochranton, Pa.
Drafting machines

Drake Manufacturing Co., 1713 W. Hubbard St., Chicago 22, Ill.
Dial & signal lights

(See advertisement on page 31)

Driftmeter, Inc., 616 Exchange Bank Bldg., Tulsa 3, Okla.
Oil well instruments

Ducommun Co., M., 580 Fifth Ave., New York, N. Y.
Coil-spring stopwatches

Du Mont Labs., Inc., Allen B., 2 Main Ave., Passaic, N. J.
Cathode-ray oscillographs, cathode-ray tubes, associated electronic equipment, television control, studio & transmitting equipment

(See advertisement on page 65)

Duncan Electric Mfg. Co., Lafayette, Ind.
A-c. & d-c. watthour meters, service & switchboard types; portable test meters, appliance meters & instrument transformers

Dunn, Inc., Struthers, 150 N. 13th St., Philadelphia, Pa.
Relays, timing devices, electric counters, thermostats

Durant Manufacturing Co., 1914 N. Buffum St., Milwaukee 1, Wis.
Counting & measuring machines

Dusenbery, John, 150 Pine St., Montclair, N. J.
Designers and builders of nautical instruments and special mechanical devices

Dwyer Mfg. Co., F. W., 317 S. Western Ave., Chicago 12, Ill.
Portable & stationary draft gages, CO_2 indicators & combustion testing sets

Dynamatic Corp., 3307 14th Ave., Kenosha, Wis.
Variable speed drives, torque measuring equipment

E

Eagle Signal Corp., 202 20th St., Moline, Ill.
Industrial control devices, traffic signal controllers & sign flashers

Eastern Industries, Inc., 45 Fox St., New Haven 6, Conn.
Laboratory pumps, stirrers & thermoregulators

Eastern Science Supply Co., 7-9 High St., Brookline, Mass.
Meteorological instruments

Eastern Specialty Co., 3617 N. 8th St., Philadelphia, Pa.
Testing equipment for checking & maintenance of all types of electricity meters such as watthour meters, demand instruments, etc. Special apparatus for load survey work.

(See advertisement on page 12)

Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Photographic equipment for laboratories, spectrography, X-ray, etc.

Eastman Oil Well Survey Co., P. O. Box 408, Long Beach 1, Calif.
Underground surveying equipment

Eberbach & Son Co., Inc., 200 E. Liberty St., Ann Arbor Mich.
Laboratory apparatus

Eby, Inc., Hugh H., 18 W. Chelten Ave., Philadelphia 44, Pa.
Relays & radio parts

Echo Electrical Manufacturing Co., 1922 Freeman Ave., Cincinnati 14, Ohio
Electronic & mechanical timers, time delay relays

Eclipse-Pioneer Div., Bendix Aviation Corp., Bendix, N. J.
Aircraft electrical & mechanical accessories

Economy Electric Devices Co., 37 West Van Buren St., Chicago 5, Ill.
Electric meters, watthour & amperehour, for street and electric railways and trolley busses

Edelmann & Co., E., 2332 Logan Blvd., Chicago 47, Ill.
Automotive test instruments

Edin Electronics Co., 207 Main St., Worcester, Mass.
Oscillographs and oscilloscopes

Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Sealed-in-glass control devices, including thermostatic switches, fire detection thermostats, & timing relays. Hermetically sealed thermostatic valves. Special control equipment

Eitzen Co., Louis C., 17 W. 60th St., New York 23, N. Y.
Extensometers

Electric Auto-Lite Co., Chrysler Bldg., New York 17, N. Y
Pressure & vacuum gages, speedometers, tachometers & thermometers

Electric Eye Equipment Co., Danville, Ill.
Automatic inspection devices

Electric Glass Co., 249 N. 4th St., Philadelphia 6, Pa.
Thermostats

Electric Heat Control Apparatus Co., 507 Fifth Ave., New York 17, N. Y.
Laboratory ovens

Electric Hotpack Co., Inc., Melrose St. at Cottman Ave., Philadelphia 35, Pa.
Designers and manufacturers of heat control and laboratory equipment

(See advertisement on page 17)

Electric Indicator Co., 21 Parker Ave., Stamford, Conn.
Synchronous motors, position indicators, level controls, signalling devices

Electric Sorting Machine Co., Michigan Trust Bldg., Grand Rapids 2, Mich.
Color analyzers

Electric Speed Indicator Co., 3619 Rocky River Drive, Lakewood, Ohio.
Precision electric tachometers & remote position indicators

Electric Switch Corp., 1409 Union St., Columbus, Ind.
Mercury switches

Electric Tachometer Corp., 1358 Spring Garden St., Philadelphia 23, Pa.
Speed indicators & recorders, electric & mechanical counters

Electric Coil Winding Co., 2736 Saunders St., Camden, N. J.
Magnet & Solenoid coils

Electrical Facilities Inc., 4224 Holden St., Oakland 8, Calif.
Apparatus for electrical measuring & testing, including precision transformers, watthour meter and instrument transformer testing equipment; rectifier apparatus

Electrimatic Div., Simonize Co., Chicago 16, Ill.
Automatic control valves & controls, regulating valves. Pressure, temperature & electrical actuation

Electro-Mechanical Instrument Co., 812 Chestnut St., Perkasee, Pa.
Electrical instruments

Electro Mechano Co., 261 E. Erie St., Milwaukee 2, Wis.
Tachometers, precision drill press

Electro-Medical Laboratory, Inc., Holliston, Mass.
Neurological & Allied medical instruments & general electronic apparatus

(See advertisement on page 22)

Electro Products Laboratories, Inc., 549 West Randolph St., Chicago 6, Ill.
Battery eliminators & rectified A. C. devices

(See advertisement on page 32)

Electro-Tech Equipment Co., 119 Lafayette St., New York 13, N. Y.
Ammeters, voltmeters, power analyzers, bridges

(See advertisement on page 14)

Electro-Voice Mfg. Co., Buchanan, Mich.
Microphones

Electrocon Corp., 219 Sunrise Highway West, Freeport, N. Y.
Vibration measuring instruments & equipment for dynamic balancing of rotating machines

Electronic Associates, Inc., 61 Brighton Ave., Long Branch, N. J.
Aircraft and electrical instruments

Electronic Controls, Inc., 44 Summer Ave., Newark 4, N. J.
Electronic controllers and timers for counting, lighting, etc.

Electronic Development Co., 4408 N. 23rd St., Omaha, Neb.
Electronic devices and electrical instruments

Electronic Development Lab., 2655 W. 19th St., Chicago 8, Ill.
Electronic apparatus

INDUSTRIAL ELECTRONIC INSTRUMENTS

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Photo Electric
INDICATORS, RECORDERS and CONTROLLERS
for
SMOKE
FLAME
TURBIDITY
COLOR
SPECIFIC GRAVITY
and
SPECIAL APPLICATIONS

•

ESS INSTRUMENT CO.
96 S. WASHINGTON AVE.,
BERGENFIELD, N. J.

Electronic Laboratories, Inc., 122 W. New York St., Indianapolis 4, Ind.
Rectifiers & intercommunication systems

Electronic Mfg. Co., 140 S. Second St., Harrisburg, Pa.
Oscillators, voltmeters

Electronic Products Co., Box 74, North Aurora, Ill.
Electronic devices

Electronic Products Co., 5330 E. Olympic Blvd., Los Angeles 22, Calif.
Glass instruments & apparatus

Electrons, Inc., 127 Sussex Ave., Newark 4, N. J.
Gas-filled & grid-control rectifier tubes

Elematic Equipment Corp., 1150 W. Marquette, Chicago 17, Ill.
Pyrometers

Elgin National Watch Co., Elgin, Ill.
Watches, clocks, aircraft instruments, navigational instruments

Ellison Draft Gage Co., 214 West Kenzie St., Chicago 10, Ill.
Manometers, draft gages, orsats

Emerson Apparatus Co., 171 Tremont St., Melrose, Mass.
Calorimeters

Engel, Inc., H. C. M., P. O. Box 233 1, Sidney, N. Y.
Small drills, small turned parts, millstones in sapphire and block grinding discs

Engelhard, Inc., Charles, 900 Passaic Ave., East Newark, N. J.
Industrial instruments

(See advertisement on page 71)

English, R. E., 1283 Sargent Ave., St. Paul 5, Minn.
Optical flats & precision lenses

Engineering Laboratories, Inc., 602 E. 4th St., Tulsa 1, Okla.
Seismic exploration equipment, vibration detectors, petroleum engineering devices, signalling equipment

Eppley Laboratory Inc., 12 Sheffield Ave., Newport, R. I.
Thermopiles, pyrheliometers & standard cells for both industrial & laboratory use

(See advertisements on Inside Front Cover and page 21)

Equipoise Controls, 100 Stevens Ave., Mount Vernon, N. Y.
Thermometers

(See advertisement on page 95)

Erickson Specialty Co., 39 Mohawk St., Cohoes, N. Y.
Solenoid valves

Erie Resistor Corp., 644 West 12th St., Erie, Pa.
High frequency & molded resistors

Ermastat Co., 1825-39 Wylie St., Philadelphia 30, Pa.
Electric motor overload protectors

Gaertner

MEASURING INSTRUMENTS
Cathetometers
Creep Test Instruments
Comparators
Micrometer Microscopes
Micrometer Slides
Standard Scales
Toolmaker Microscopes

DIVIDING MACHINES
Circular
Linear
Manual
Automatic

INTERFEROMETERS
Michelson
Fabry Perot
Thermal Expansion

POLARIZING APPARATUS
Compensators
Polarimeters
Polariscopes

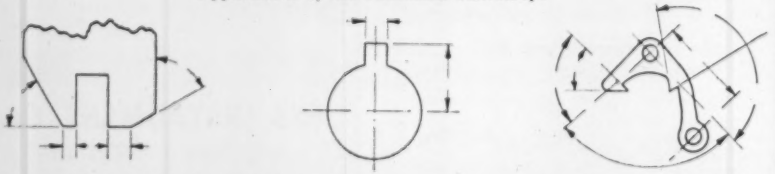
OPTICAL TEST INSTRUMENTS
Optical Benches
Spherometers
Spectrometers
Microscopes
Telescopes
Refractometers

SPECTROGRAPHS
Infrared
Quartz
Raman
Spectroscopes
Monochromators

PHOTOMETERS
Martens
Spectrophotometers
Microdensitometers

MISCELLANEOUS
Chronographs
Laboratory Supports
Precision Ruling

Applications of the Toolmaker Microscope



THE GAERTNER SCIENTIFIC CORP.
1208 Wrightwood Ave. : Chicago 14 : U. S. A.

Espey Mfg. Co., 305 E. 63 St., New York 21, N. Y.
Signal generators, audio oscillators, test equipment, radio receivers, transmitters, electronic devices

Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J.
Industrial electronic instruments, photoelectric for smoke, flame, turbidity, color. Specific gravity indicators, recorders and controllers

(See advertisement on page 113)

Esterline-Angus Co., Inc., P. O. Box 596, Indianapolis 6, Ind.
Graphic recording & contract-making electrical instruments, time, speed, condensate purity, pressure & vacuum recorders, telemeters & portable current transformers

Etched Products Corp., 39-01 Queens Blvd., Long Island City 4, N. Y.
Dials, scales & panels

Eureka X-Ray Tube Corp., 3240 N. Kilpatrick Ave., Chicago, Ill.
X-ray tubes

Everson Mfg. Co., 214 W. Huron St., Chicago 10, Ill.
Chemical feeders

Exact Weight Scale Co., 944 West 5th Ave., Columbus 8, Ohio
Over-and-under weight scales & indicators for industrial purposes

F

Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.
Scales

Fairchild Camera & Inst. Co., 88-06 Van Wyck Blvd., Jamaica 1, N. Y.
Instrument motors, servo-motors, navigational instruments, oscilloscope- and X-ray recording cameras.

Falstrom Co., 147 Falstrom Ct., Passaic, N. J.
Steel instrument panels, panel board assemblies, cubicles, totally enclosed weather & vermin proof instrument enclosures & steel cabinets.

(See advertisement on page 4)

Farnsworth Television & Radio, Fort Wayne, Ind.
Industrial television systems

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Calipers for checking roll diameters & gear tooth comparators

Fassett Co., Inc., C. M., W. 21 Main Ave., Spokane 8, Wash.
Laboratory supplies

Fast & So., John E., 3105 N. Crawford St., Chicago 41, Ill.
Capacitors

Fecker, J. W., 2016 Perrysville Ave., Pittsburgh 14, Pa.
Astronomical instruments

(See advertisement on page 51)

Federal Anti-Capacity Switch Corp., 1200 Niagara St., Buffalo, N. Y.
Anti-capacity switches

Federal Instrument Co., 14-02 Broadway, Long Island City 2, N. Y.
Resistors

Federal Mfg. & Eng. Corp., 211 Steuben St., Brooklyn 5, N. Y.
Microscopes

Federal Pneumatic Systems, Inc., 127 N. Dearborn St., Chicago 2, Ill.
Particle size classifiers

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Precision measuring instruments

(See advertisement on page 39)

Federal Telegraph Co., Inc., 200 Mt. Pleasant Ave., Newark 1, N. J.
Radio transmitting and direction finding equipment, transmitting tubes, field intensity meters, high speed engine indicators

Fellows Gear Shaper Co., Springfield, Vt.
Gear checking machines & involute measuring machines

Felsenthal & Sons, G., 4110 W. Grand Ave., Chicago 51, Ill.
Dial faces & pointers, name plates, instruction plates & computing scales

Fenwall, Inc., 3 Main St., Ashland, Mass.
Industrial thermostats

Ferguson Co., 814 Ridgely St., Baltimore 30, Md.
Laboratory supply house

Ferner Co., R. Y., 131 State St., Boston 9, Mass.
Precision instruments

(See advertisement on page 56)

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.
Electrical instruments

Ferris Instrument Corp., Boonton, N. J.
Laboratory & production testing equipment, radio noise & field strength meters & special electrical instruments

Fidelity Machine Co., 3906 Frankfort Ave., Philadelphia, Pa.
Abrasion testers

Field Electrical Instrument Co., 2432 [illegible] Cottage Grove course, New York, N. Y.
Electrical instruments

Fink-Roselieve Co., Inc., 109 W. 6th St., New York, N. Y.
Thermometers

Fischer & Porter Co., 37 County Line Rd., Hatboro, Pa.
Rotameters, sight flow meters, automatic flow recording controllers, precision optical cells, precision glass tubing & special precision glass apparatus

(See advertisements on pages 27, 34 [illegible])

Fish-Schurman Corp., 230 East 45 St., New York 17, N. Y.
Scientific instruments, optical, technical & scientific glassware & porcelain

(See advertisement on page 47)

Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Furnaces & ovens

Fisher Governor Co., Marshalltown, Iowa
Motor control valves & regulators

Fisher-Pierce Co., 70 Ceylon St., Boston 21, Mass.
Photoelectric controls, relays, timers

Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
Leak detector & pipe finder. Electronic equipment

Fisher Scientific Co., 711 Forbes St., Pittsburgh 19, Pa.
Standard & special equipment & instruments for chemical, biological & metallurgical laboratories

Fleischhauer & Son, F., 89-36 187 Place, Hollis, L. I., N. Y.
Instrument makers

Flett Laboratory, 17 Madison Ave., Lansdowne, Pa.
Laboratory apparatus, scientific cameras, counters, photometers

Flow Controls, Inc., 1821 W. North Ave., Chicago 22, Ill.
Refrigeration controls

Fluid Meters, Inc., 44 Wall St., Room 1101, New York, N. Y.
Positive displacement meters, 1/10 to 8 gallons per sour with gravity pressures

Fonda Gage Co., 53 Daly St., Stamford, Conn.
Gage blocks

Ford Motor Company, 3000 Schaefer Rd., Dearborn, Mich.
Johansson gage blocks & accessories such as parallels, adjustable holders, scribers, straight edges, outer points, sine bars

Ford Regulator Valve Co., 403 Broome St., New York 13, N. Y.
Regulating valves

Foster Engineering Co., 109 Monroe St., Newark 1, N. J.
Control valves

Foxboro Co., 46 Neponset Ave., Foxboro, Mass.
Indicating, recording & controlling instruments for pressure, temperature, humidity, level & flow

(See advertisement on page 5)

Freas Glass Works, Francis L., 146 E. 9th St., Conshohocken, Pa.
Hydrometers, thermometers & glass instruments

Fredericks Co., George E., Bethayres, Pa.
Glass instruments & apparatus

Freed Transformer Company, Inc., 72 Spring St., New York 12, N. Y.
Transformers

Frick Co., Inc., Waynesboro, Pa.
Float valve controls & electric controls, refrigerating & air conditioning machinery

Fried & Lustig, Inc., 31 Union Square, New York 3, N. Y.
Thermometers

Friez Instrument Div., Bendix Aviation Corp., Baltimore 4, Md.
Temperature & humidity controls, gas & stoker controls, damper motors, electrical relays, temperature & humidity indicators & recorders, psychrometers, draft gages, anemometers, CO_2 analyzers

Fuess, Inc., R., 39 West 60th St., New York 23, N. Y.
Scientific instruments

Fuller Co., 110 Bridge St., Catasauqua, Pa.
Bulk material level controllers

Fulton Sylphon Co., Knoxville 4, Tenn.
Temperature & pressure regulators, sylphon bellows; thermostat assemblies; diesel controls; automobile thermostats; air conditioning controls

Furnas Electric Co., 300 McKee St., Batavia, Ill.
Pressure controls

Furst Electronics, 700 W. North Ave., Chicago 22, Ill.
Electronic instruments

G

Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.
Measuring instruments including toolmaker microscopes, micrometer slides, micrometer microscopes, comparators, interferometers, spherometers, microscopes & telescopes for observation & inspection; time recording devices including chronographs & special devices; dividing machines for engraving linear & circular scales; goniometers; spectroscopic equipment & accessories

(See advertisement on page 114)

Gallen, E. P., 220 W. 5 St., Los Angeles 13, Calif.
Instrument lathes & tools

Gardner Laboratory, Inc., Henry A., 4723 Elm St., Bethesda 14, Md.
Scientific instruments, automatic inspection devices

Gas Appliance Specialties Co., 57th St., bet. Northern Blvd. & 32nd Ave., Woodside, New York, N. Y.
Gas regulators

Gates & Co., Geo. W., Franklin Sq., Long Island City, N. Y.
Light sources & etching compounds for glass & quartz

Gauthier, Donat A., 7408 Poe Ave., Detroit 6, Mich.
Gasoline measuring devices & automobile service station testers

Geier & Bluhm, Inc., 607 River St., Troy, N. Y.
Mechanical devices & spirit level vials
(See advertisement on page 51)

Gelber, Samuel S., 542 W. Washington Blvd., Chicago 6, Ill.
Balancing machines

Gerales, Andrew, 29 Second Ave., Nyack, N. Y.
Toolroom test indicators

General Biological Supply House, Inc., 761 East 69th Pl., Chicago 37, Ill.
Biological laboratory supplies

General Combustion Corp., 2218 W. Lake St., Chicago 12, Ill.
Combusiton equipment

General Control Co., 1200 Soldiers Field Rd., Boston 34, Mass.
Electrical switches

General Controls Co., Box 1431, Glendale 5, Calif.
Pressure, temperature & flow control valves
(See advertisement on page 24)

General Electric Co., 1 River Rd., Schenectady 5, N. Y.
Electrical instruments & meters
(See advertisements on pages 12, 52, 68, 90)

General Electric Co., 1285 Boston Ave., Bridgeport 2, Conn.
Rectifiers & switches

General Electric Co., Electronic Div., 1001 Wolf St., Syracuse, N. Y.
Electronic equipment

General Electric Co., Lamp Dept., Nela Park, Cleveland 12, Ohio
Lighting sources

General Electric X-Ray Corp., 175 W. Jackson Blvd., Chicago 4, Ill.
Medical, dental & industrial X-ray apparatus, accessories & suppliers

General Luminescent Corp., 732 Federal St., Chicago 5, Ill.
Luminous paint, fluorescent dials & pointers, radioactive dials & pointers, phosphorescent dials & pointers

General Magnetic Corp., 10001 Erwin Ave., Detroit 5, Mich.
Permanent magnets

General Physical Laboratory, 509 Fifth Ave., New York 17, N. Y.
Special light sources

General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.
Radio & electrical measuring instruments for laboratory & industrial use; stroboscopes, noise, measuring equipment, measuring & test equipment for electrical communication systems

General Regulator Corp., 165 Broadway, New York 6, N. Y.
Combustion, draft, liquid level & pressure controls

General Scientific Corp., 4829 So. Kedzie Ave., Chicago 32, Ill.
Lenses & photoelectric cells

General Test Equipment Co., 38 Argyle Park, Buffalo 9, N. Y.
Pen size radio signal source, also special apparatus

Geophysical Instrument Co., Key Blvd. & Nash St., Arlington, Va.
Instruments & accessories for prospecting for oil, minerals, water, bedrock; also equipment for making measurements in wells, radioactivity instruments
(See advertisements on pages 31, 47)

G. & G. Precision Works, Inc., 5-33 Forty-eighth Ave., Long Island City 1, N. Y.
Mechanical, optical & electrical precision instruments

Gilmore, E. R., Box 5718, Homewood Sta., Pittsburgh 8, Pa.
Gas leak stethoscopes

Gisholt Machine Co., Madison 3, Wis.
Static & dynamic balancing machines

Gleason-Avery, Inc., Auburn, N. Y.
Furnace controls

Glendale Optical Co., 249 Pennsylvania Ave., Brooklyn 7, N. Y.
Prisms, lenses, flats, mirrors, verticles & optical units

Globe Industries, Inc., 125 Sunrise Place, Dayton, O.
Aircraft instrument testing equipment, aircraft interval timing instruments, aircraft photo equipment, automatic control instruments

Globe Phone Mfg. Corp., Reading, Mass.
Pipe locating equipment, leaky valve locators, hearing aids, secret phone or listening equipment for government investigating agencies

Globe Tool & Engg. Co., 410 Davis Ave., Dayton 3, Ohio
Dynamic balancing equipment

Glagau & Co., Inc., 1912 W. Birchwood, Chicago 26, Ill.
Calipers

G-M Laboratories, Inc., 4326 N. Knox, Chicago 41, Ill.
Galvanometers and galvonometer relays

G. M. Manufacturing Co., 248 Lafayette St., New York, N. Y.
Thermometers, hydrometers, psychrometers, hygrometers

Goerz, American Optical Co., C. P. 317 East 34th St., New York 16, N. Y.
Photographic lenses, optical prisms & flats, and other optical units to specification

Goetze Niemer Co., 808 Francis St., St. Joseph 1, Mo.
Laboratory supply house

Gogan Machine Corp., 1440 E. 55 St., Cleveland 3, Ohio
Automatic hardness testers

Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif.
Surveying instruments, pipe locators, leak detectors

Goodrich Co., B. F., 450 South Main St., Akron, Ohio
Vibration absorbers

Gordon Co., Claud C., 3000 S. Wallace St., Chicago 16, Ill.
High temperature equipment accessories, such as thermocouples, thermocouple wire, lead wire, insulators

Gorrell & Gorrell, Haworth, N. J.
Equipment for biological & psychological work

Gotham Instrument Co., 149 Wooster St., New York 12, N. Y.
Indicating dial & recording thermometers
(See advertisement on page 8)

Gotham Scientific Co., 106 Water St., New York 5, N. Y.
Laboratory supplies

Gow-Mac Instrument Co., 22 Lawrence St., Newark 5, N. J.
Thermal conductivity gas analyzers & gas analysis cells
(See advertisement on page 46)

Grammes & Sons, L. F., 384 Union St., Allentown, Pa.
Metal stamps & wire formings

Gray Instrument Co., 64½ W. Johnson St., Philadelphia 44, Pa.
Scientific instruments

Gray Laboratory & Mfg. Co., 43 W. Apple St., Dayton 2, Ohio
Timers and switches

Grayhill, Inc., 1 N. Crawford Ave., Chicago, Ill.
Switches

Green, Henry J., 1191 Bedford Ave., Brooklyn 16, N. Y.
Meteorological instruments

Greene Bros., Inc., 1810 Griffin St., Dallas 2, Texas
Laboratory supplies

Greenfield Tap & Die Corp., Greenfield, Mass.
Machine shop gages

Greiner, Inc., Emil, 55 Vandam St., New York 13, N. Y.
Laboratory supplies

Griebel Co., E., 8 Wayne St., Carbondale, Pa.
Thermometers, hydrometers, chemical & laboratory glassware

Griner Co., A. J., 417 East 13th St., Kansas, City, Mo.
Laboratory supplies

Grove Regulator Co., 1190 67th St., Oakland 8, Calif.
Pump governors, pressure reducing & back pressure regulators for gas or liquid pressures to 6000 lbs.

Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill.
A-c. and d-c. relays

Gulow Corp., 99 Park Place, New York 7, N. Y.
Variable voltage transformers

Gump Co., B. F., 435 S. Clinton St., Chicago 7, Ill.
Scales

Gurley, W. & L. E., 514 Fulton St., Troy, N. Y.
Surveying & allied engineering instruments, paper testing & aeronautical navigation instruments & standard weights & measures

H

Hagan Corp., Hagan Bldg., Pittsburgh 30, Pa.
Combustion control equipment; flow meters, draft & pressure gages for low pressure gas & air measurements; recording, indicating & integrating in any combination
(See advertisement on page 35)

Halldorson Co., 4500 Ravenswood Ave., Chicago 40, Ill.
Laboratory transformers

Halliburton Oil Well Cementing Co., Duncan, Okla.
Oil well surveying instruments

Hamilton Kent Mfg. Co., Kent, Ohio
Vibration mountings

Hamilton Mfg. Co., Two Rivers, Wis.
Laboratory furniture

Hamilton Watch Co., Lancaster, Pa.
Chronometers & watches

Hammel-Dahl Co., 243 Richmond St., Providence, R. I.
Automatic control valves
(See advertisement on Inside Back Cover)

Hand & Sons Co., John E., Atlantic & Washington Aves., Haddonfield, N. J.
Navigational instruments

Hanovia Chemical & Mfg. Co., 90 Chestnut St., Newark 5, N. J.
Quartz mercury arc lamps

Hansen Co., Wm., 165 Silverbrook Ave., Niles, Mich.
Timers and clocks

Hardwick, Hindle, Inc., 40 Herman St., Newark 5, N. J.
Resistors

Harris Instruments, Inc., 1246 Taylor St., N.W., Washington 11, D. C.
Single fiber testers

Hart Manufacturing Co., 110 Bartholomew Ave., Hartford 1, Conn.

Hart Mfg. Co., R. E., 416 Ward Bldg, Battle Creek, Mich.
Production counters

Hart Moisture Gauges, Inc., 126 Liberty St., New York 6, N. Y.
Moisture gages
(See advertisement on page 57)

Hart Moisture Meters, Grand Central Terminal, New York, N. Y.
Moisture testers

Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Electronic apparatus

Harvey-Wells Electronics, Inc., Southbridge, Mass.
Aircraft navigational instruments

Hasler-Tel Co., 30 Vesey St., New York 7, N. Y.
Speed indicators, portable, chronometric

Hastings Instrument Co., P. O. Box 1275, Hampton, Va.
Consulting instrument engineers, special developments

Hathaway Instrument Co., 1315 S. Clarkson St., Denver 10, Colo.
Instruments & apparatus for electrical & mechanical measurements & control

Hawk Tool & Engineering Co., 7663 Epworth Blvd., Detroit 4, Mich.
Controllers & testing devices

Haydon Co., A. W., 111 W. Main St., Waterbury 32, Conn.
Relays and timers

Hays Scientific Appliances, 202 N. Broadway, Urbana, Ill.
Scientific instruments

Hays Corp., P. O. Box 299, Michigan City, Ind.
Combustion instruments & automatic combustion controls
(See advertisements on pages 23, 25, 40, 46)

Hayward Optical Co., Inc., 217 Magnolia St., Whittier, Calif.
Optical parts, filters & prisms

H-B Instrument Co., Inc., 2518 N. Broad St., Philadelphia 32, Pa.
Thermometers & hydrometers, remote control equipment
(See advertisements on pages 70, 93)

HD Electric Co., 219 N. Aberdeen, Chicago 7, Ill.
Split core ammeters, demand meters

Hebler Co., W. O., Central at Long Ave., Hillside, N. J.
Electricad gas analyzers

Heil Chemical & Mfg. Co., 216 S. 4 St., St. Louis 2, Mo.
Laboratory supplies

Heiland Research Corp., 130 E. 5th Ave., Denver 9, Colo.
Geophysical instruments, photoflash synchronizers, gas detectors, oscilliographs, strain gages, vibration detectors, recording cameras & industrial instruments.
(See advertisement on page 60)

Heise Bourdon Tube Co., Brook Rd., Newtown, Conn.
Bourdon tube devices
(See advertisement on page 42)

Helicoid see American Chain & Cable Co.

Hellpot Corp., 1011 Mission St., South Pasadena 8, Calif.
Rheostats, voltage dividing resistors

Hellige, Inc., 3718 Northern Blvd., Long Island City, N. Y.
Scientific instruments, laboratory & bacteriological supplies

Henderson & Co., H. B., Virginia Ave., Chester, W. Va.
Pyrometric cones

Henschel & Co., Inc., John, 105 E. 29th St., New York 16, N. Y.
Drawing instruments

Henson Co., Fred C., 3311 E. Colorado St., Pasadena, Calif.
Electroscope

Henszey Co., Watertown, Wis.
Feed water meters, flow indicators, continuous blowdown, heat exchangers and boiler feed regulators. Also meters and flow indicators for corrosive chemicals.

Herbach & Rademan, Inc., 522 Market St., Philadelphia 6, Pa.
Electronic instruments

Herkimer Tool & Model Works, 119 George St., Herkimer, N. Y.
Sine bars & gaging fixtures

Herman Stone Co., 324 Harries Bldg., Dayton 2, Ohio
Precision granite surface plates

Hetherington & Berner, 701 Kentucky Ave., Indianapolis 7, Ind.
Fluidometers

Hetherington & Son., Inc., Robert, P. O. Box 204, Sharon Hill, Pa.
Switches

Heusser Instrument Mfg. Co., 134 West Second South St., Salt Lake City 1, Utah
Analytical balances

Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, California
Electronic equipment

Heyman Mfg. Co., 530 Michigan Ave., Kenilworth, N. J.
Inspection instruments

H & H Thermostats, Inc., 682 Broadway, New York 12, N. Y.
Altimeters, recording thermometers, recorder ink for extreme temperatures

Hickok Electric Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio
Electric indicating instruments
(See advertisements on pages 15, 38, 106)

Hiergesell & Sons, Wm., 295 Pearl St., New York 7, N. Y.
Thermometers & hydrometers

High Voltage Engineering Corp., 7 University Road, Cambridge, Mass.
High voltage devices

Hobbs Corp., John W., Springfield, Ill.
Engine pressure meters

Hoke, Inc., 148 S. Dean St., Englewood, N. J.
Regulators

Holtzer-Cabot Electric Co., 125 Amory St., Boston 19, Mass.
Fractional Horsepower Motors

Hopp Press, Inc., 460 W. 34 St., New York 1, N. Y.
Nameplates, dial faces, scales, instruction plates
(See advertisement on page 32)

Houston Technical Laboratory, 2218 Branard St., Houston 6, Texas
Gravity meters for geophysical prospecting

Howard Clock Products, Inc., 256 Charles St., Waltham, Mass.
Observatory & seismological clocks

Howe & French, Inc., 99 Broad St., Boston 10, Mass.
Laboratory supplies

Howe Scale Co., Rutland, Vt.
Scales

Hull Mfg. Co., P. O. Box 246, Warren, Ohio
Compasses

Humboldt Mfg. Co., 2014 N. Whipple St., Chicago 47, Ill.
Cement & concrete testers

Hunt & Son, Inc., C. B., Salem, Ohio
Valves & valve operating devices

Huppert Co., K. H., 6830 Cottage Grove Ave., Chicago, Ill.
Laboratory furnaces

Hydraulic Div., New York Air Brake Co., 420 Lexington Ave., New York, N. Y.
Hydraulic control systems

I

Ideal Industries, Inc., 1420 Park Ave., Sycamore, Ill.
Insulation testers & revolution counters

Ideal Laboratory Tool & Supply Co., P. O. Box 193, Cheyenne, Wyo.
Aircraft instrument test apparatus, sensitive needle valves

Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago 10, Ill.
Indicating pyrometers, resistance thermometers pyrometer controllers, air velocity meters, metal detectors
(See advertisement on page 11)

Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill.

Impact Register Co., 315 So. Neil St., Champaign, Ill.
Instruments for determining and recording impacts received by railroad cars and riding qualities of railroad cars, automobiles

Indiana Steel Products Co., 6 N. Michigan Ave., Chicago 2, Ill.
Instrument magnets

Industrial Condenser Corp., 3243 N. California Ave., Chicago 18, Ill.
Oil, paper & electrolytic capacitors

Industrial Engineering Corp., Rea Bldg., Terre Haute, Ind.
Relays

Industrial Filter & Pump Mfg. Co., 1621 Carroll Ave., Chicago 12, Ill.
Salt spray testers
(See advertisement on page 87)

Industrial Instruments, Inc., 156 Culver Ave., Jersey City 5, N. J.
Electrical measuring & test equipment
(See advertisement on page 58)

Industrial Pyrometer & Supply Co., Alton, Ill.
Thermocouples

Industrial-Scientific Supply Co., 824 Monroe St., Fort Worth 1, Texas
Laboratory supplies

Industrial Timer Corp., 117 Edison Place, Newark 5, N. J.
Industrial timers, motor driven, with automatic reset. Controllers, signals, testing equipment for electrical parts (operation or life test)

Inferno Co., Box 1138, Shreveport 90, La.
Combustion instruments

Instrument Development Labs., 817 E. 55th St., Chicago 15, Ill.
Radiation detection instruments
(See advertisement on page 30)

Instrument Electronics, 253-21 Northern Blvd., Little Neck, L. I., N. Y.
Electronic instruments

Instrument Laboratories, 800 W. North Ave., Chicago 22, Ill.
Electrical testing sets

Instrument Laboratory Inc., P. O. Box 4098, Interbay Station, Seattle 99, Washington
Counting & indicating instruments
(See advertisement on page 58)

Instrument Resistors Co., 1036 Commerce Ave., Union, N. J.
Instrument resistors

International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.
Scales & time instruments

International Equipment Co., 352 Western Ave., Brighton, Boston 35, Mass.
Analytical centrifuges

International Register Co., 2620 W. Wash. Blvd., Chicago 12, Ill.
Coin meters—timers for electric ranges & gas ovens

International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.
Metallized & wirewound fixed & variable resistors including high voltage & high frequency types

Islep Radio Mfg. Corp., Foot of Beech St., Islep, N. Y.
Amplifiers

Ithaca Scientific Instrument Co., Ithaca, N. Y.
Drawing instruments

J

Jackson Electrical Instrument Co., 18 S. Patterson Blvd. Dayton 1, Ohio
Radio testing equipment

Jacobs Bros. Co., Inc., 1 Main St., Brooklyn 1, N. Y.
Scales

Jaeger Watch Co., Inc., 304 East 45th St., New York 17, N. Y.
Automobile clocks, timepieces for aviation and marine, chronomatic tachometers & true airspeed indicators

Jansson Gage Co., 19206 Glendale Ave., Detroit 23, Mich.
Gages; gage blocks—special, built up; flush pin and thread gages, carboloy or steel

Jardur Import Co., 875 Broadway, New York 3, N. Y.
Chronographs & stop-watches

Jarrell-Ash Co., 165 Newbury St., Boston 16, Mass.
Representatives for Adam Hilger, Ltd., manufacturers of optical instruments
(See advertisement on page 82)

J B L Instrument Co., Sycamore & Mill Rd., Clifton Heights, Pa.
Rotary instrument switches, transformer tapping, railway signal gear, decade resistance boxes

J-B-T Instruments, Inc., 443 Chapel St., New Haven 8, Conn.
Electrical measuring & controlling instruments: pyrometers, thermocouples, selector switches, potentiometers, resistance thermometers, laboratory instruments
(See advertisements on pages 38, 85, 94)

Jeffrey Mfg. Co., Columbus 16, Ohio
Weighing, feeding, batching & proportioning equipment

Jenkins Bros., 80 White St., New York 13, N. Y.
Regulating valves

Jerguson Gage & Valve Co., 111 Fellsway, Somerville 45, Mass.
Precision gages & valves
(See advertisement on page 41)

Johansson Div., see Ford Motor Co.

Johnson Co., E. F., Gothard Div., Waseca, Minn.
Connectors, plugs, dial lights, etc.

Johnson Gage Co., 534 Cottage Grove Rd., Bloomfield, Conn.
Comparators & gages

Johnson Service Co., 507 E. Michigan St., Milwaukee 2, Wisc.
Automatic temperature & humidity control for heating, cooling, ventilating, air conditioning & industrial processes

Johnson-Williams, Ltd., Box 8, Palo Alto, Calif.
Combustible gas indicators & alarm systems, portable & continuous, including accessories
(See advertisement on page 44)

Johnston & Jennings Company, 877 Addison Rd., Cleveland 14, Ohio
Depth gages, valves

Johnston Manufacturing Co., 2823 E. Hennepin Ave., Minneapolis 13, Minn.
Furnace controls

Jones, Howard B., Div., Cinch Mfg. Co., 2460 W. George St., Chicago 18, Ill.
Connectors

Jones Electronics Co., M. C., 96 N. Main St., Bristol, Conn.
Standing wave meter

Jones & Lamson Machine Co., Clinton & Whitney Sts., Springfield, Vt.
Optical comparators

Jones-Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Tachometers, speed indicators & speedometers

Jorgan Co., 65 Atlantic Ave., Rochester, N. Y.

Judson Governor Co., 38 Browns Race, Rochester, N. Y.
Governors

K

Kalbfell Laboratories, Inc., 1076 Morena Blvd., San Diego 10, Calif.
Audio frequency equipment, bridges, capacitance meters

Kansas City Laboratory Supply Co., 1431 Wyandotte St., Kansas City 6, Mo.
Laboratory supplies

Karp Metal Products Co., Inc., 120 30th St., Brooklyn 32, N. Y.
Instrument panels

Kauffman-Lattimer Co., 263 N. Front St., Columbus 16, Ohio
Laboratory supplies

Kaydel Corp., 126 Liberty St., New York 6, N. Y.
Moisture testers

Kelley-Koett Mfg. Co., Inc., Covington, Ky.
X-Ray apparatus

Kellogg Switchboard & Supply Co., 6650 S. Cicero, Chicago 38, Ill.
Relays

Kendall, James W., 13 Miantonomi Ave., Newport, R. I.
Photoelectric cells

Kenyon Instrument Co., Inc., 1345 New York Ave., Huntington, L. I., N. Y.
Airport & marine instruments

Kessler Co., Walter H., 97 Reade St., New York, N. Y.
Thermometers and hydrometers
(See advertisement on page 96)

Kester Solder Co., 4216 Wrightwood Ave., Chicago 39, Ill.
Cored solders

Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J.
Surveying instruments

Kewaunee Mfg. Co., End of So. Center St., Adrian, Mich.
Laboratory furniture

Keystone Carbon Co., Inc., Saint Marys, Pa.
Carbon resistors

Kieley & Mueller Inc., 2013-2033—43 St., North Bergen, N. J.
Pressure regulating & flow control devices
(See advertisement on page 7)

Kimble Glass Co., Vineland, N. J.
Glass apparatus, glass tubing, thermometers, hydrometers

King, Andrew, 519 Broad Acres Road, Narberth, Pa.
Portable Brinell hardness tester

King Engineering Corporation, 942 Gordon Ave., Ann Arbor, Mich.
Liquid level indicators, distant reading
(See advertisement on page 41)

Kirk & Blum Manufacturing Co., 2838 Spring Grove Ave., Cincinnati 25, Ohio
Instrument panels and sheet metal assemblies

Klett Mfg. Co., 179 E. 87th St., New York 28, N. Y.
Colorimeters

Klingerit, Inc., 16 Hudson St., New York 13, N. Y.
Liquid level gages

Klipfel Mfg. Co., 1000 Weller Ave., Hamilton, Ohio
Regulating valves

Knights Company, James, Sandwich, Ill.
Crystals

Koch & Co., F. A., 72 Spring St., New York 12, N. Y.
Laboratory supplies

Kolesch & Co., 138 Fulton St., New York, N. Y.
Surveying instruments

Kollmorgen Optical Co., 2 Franklin Ave., Brooklin 11, N. Y.
Astronomical & optical instruments

Kollsman Instrument Div., Square D Co., 80-08—45th Ave., Elmhurst, Long Island, N. Y.
Precision instruments for aircraft

Krouse Testing Machine Co., 573 E. 11th Ave., Columbus 3, Ohio
Fatigue testing machines

Kuner Co., Max, 804 First Ave., Seattle, Wash.
Nautical instruments

Kurman Electronics Corp., 130 Clinton St., Brooklyn, N. Y.
Relays, electrical test equipment, hearing devices

THE FIRST LINE OPERATED DIRECT READING CONTINUOUS INDICATING pH METER

MACBETH pH METER

No batteries whatsoever. Can be left on continuously. Only one operating control. Large, easily read scale. Range—from 0 to 14 pH. Untrained users can make ordinary pH measurements.

Write for Bulletins

MACBETH CORPORATION

227 West 17th Street New York 11, N. Y.

Macbeth Corporation

L

L. A. B. Corp., P. O. Box 162, Summit, N. J.
Special instruments

Laboratory Construction Co., 1113-15 Holmes St., Kansas City 6, Mo.
Laboratory furniture & apparatus

Laboratory Equipment Corp., 720 E. Main St., Benton Harbor, Mich.
Carbon & sulphur determinators

Laboratory Furniture Co., Inc., 37-18 Northern Blvd., Long Island City 1, N. Y.
Laboratory furniture

Laboratory Materials Co., 7319 Vincennes Ave., Chicago 21, Ill.
Laboratory supplies

Laboratory Specialties, Inc., 144 S. Wabash St., Wabash, Ind.
Mirrors—front surfaces & aluminized: Monochromatic light sources, Black light apparatus, Diffraction gratings, Spectroscopes, Fluorescent & phosphorescent materials

Lambert Meter Co., Inc., Plainfield, N. J.
Gas meters

Lammert & Mann Co., 260 N. Woods St., Chicago 12, Ill.
Flow regulators & valves

LaMotte Chemical Products Co., Towson, Md.
Hydrogen ion apparatus

Lampkin Laboratories, Bradenton, Fla.
Radio-frequency meters

Landis & Gyr, Inc., 104 Fifth Ave., New York 11, N. Y.
Electric integrating meters; indicating & graphic demand meters for KW, KVA, reactive; prepayment meters; totalizing & remote; time switches; motor wound escapement or synchronous motor types with astronomic dials; miniature ball bearings
(See advertisement on page 19)

Lane Wells Co., 5610 So. Soto St., Los Angeles 11, Calif.
Oil well testing instruments

Lansing Engineering Co., Electronics Div., 735 E. Kalamazoo St., Lansing, Mich.
Counters & timers

La Pine & Co., Arthur S., 114 W. Hubbard St., Chicago 10, Ill.
Laboratory supplies

Larrimore Sales Co., P. O. Box 1234, St. Louis 1, Mo.
Magnifiers

Lavoie Laboratories, Morganville, N. J.
Ultra high frequency precision frequency meter

Lawrence & Hill, Inc., 142 Main Ave., Watertown, N. Y.
Gages & gaging fixtures

Leach Relay Co., 5915 Avalon Blvd., Los Angeles 3, Calif.
Relays

Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids 2, Mich.
Electronic & mechanical aircraft accessories; aircraft radio equipment, radio compasses, etc.

Lectrohm, Inc., 5125 W. 25th St., Cicero 50, Ill.
Resistors

Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Electrical measuring instruments for both laboratory & plant. For laboratory: bridges, galvanometers, potentiometers, photometric equipment, test sets & standards. For plant: indicators, recorders & controllers for chemical concentration, CO_2, current, electrolytic conductivity, frequency, gas analysis, humidity, Kw, Rkva, light, electrical load, pH, pressure, pyrometry, radiation, smoke density, speed, temperature, voltage, Speedomax Recorders, Centrimax Flowmeters & Metermax Combustion control Systems
(See advertisements on pages 20, 24, 64, 66, 72, 82)

Leich Electric Co., 565 W. Washington St., Chicago 6, Ill.
Electric motors & switches

Leitz, Inc., E. 304 Hudson St., New York 13, N. Y.
Optical instruments

Lektra Labs., Inc., 30 E. 10 St., New York 3, N. Y.
Timing devices

Lenox Instrument Co., 2010 Chancellor St., Philadelphia 3, Pa.
Optical and technical instruments

Leslie Co., Lyndhurst, N. J.
Pressure reducing valves, pump governors, temperature regulators

Leupold & Stevens Instruments, 4445 N. E. Glisan St., Portland 13, Ore.
Recorders & indicators, for irrigation, power, waterworks, sewerage. Equipment for hydraulic laboratories. Snow-rain recorders, hydrographic accessories, transits, levels

Levin & Son, Louis, 782 E. Pico Blvd., Los Angeles, Calif.
Instrument lathes

Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Portable pyrometers, potentiometers, resistance thermometers & other electrical temperature measuring devices
(See advertisement on Outside Back Cover)

Lewyt Metal Products, 60 Broadway, Brooklyn 11, N. Y.
Instrument housings

Lincoln Park Industries, Inc., 1719 Ferris Ave., Lincoln Park 25, Mich.
Precision inspection equipment

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Gas gages, gas flowmeters, oxygen regulators

Link Aviation Devices, Inc., Binghamton, N. Y.
Aircraft navigational instruments

Link Engineering & Mfg. Co., 13845 Elmira St. Detroit 27, Mich.
Spring testers

Liquidometer Corp., 36-16 Skillman Ave., Long Island City 1, N. Y.
Liquid level gages
(See advertisement on page 41)

Liquid Scale Gauge Co., 100 N. First St., Minneapolis 1, Minn.
Liquid level indicating gages

Littlefuse Inc., 4757 N. Ravenswood Ave., Chicago 40, Ill.
Low amperage precision fuses & fuse mountings

Lonergon Co., J. E., 213 Race St., Philadelphia, Pa.
Pressure gages

Lord Mfg. Co., 1635 W. 12 St., Erie, Pa.
Bonded rubber vibration isolation mountings & flexible couplings for practical horsepower motors

L & R Manufacturing Co., 577 Elm St., Arlington, N. J.
Instrument cleaning machines & cleaning & rinsing solutions. Crystal cement

Luers, J. Milton, 12 Pine St., Clemens, Mich.
Timers

Lufkin Rule Co., Saginaw, Mich.
Precision tools & measuring tapes

Lumenite Co., 37 West Van Buren St., Chicago 5, Ill.
Photoelectric controls

Lundquist Tool & Mfg. Co., 57 Jackson St., Worcester 8, Mass.
Ammeters

Lux Clock Mfg. Co., 95 Johnson St., Waterbury 91, Conn.
Automatic timers & clock mechanisms

Lyman Electronic Corp., 12 Cass St., Springfield, Mass.
Radio test instruments

M

Macbeth Corp., 227 West 17th St., New York 11, N. Y.
Hydrogen ion meters
(See advertisements on pages 50, 64, 117)

Macbeth Daylighting Corp., 227 West 17 St., New York 11, N. Y.
Daylight lamps for titration & color matching

Machlett Laboratories, Inc., Springdale, Conn.
Vacuum tubes

Machlett & Son, E., 220 East 23rd St., New York 10, N. Y.
Laboratory apparatus & supplies

MacLeod & Hanopol, Chelsea & Joiner St., Charlestown 29, Mass.
Radio testing instruments

Madison Electrical Products Div., John G. Ruckelshaus Co., Madison, N. J.
Chokes, resistances

Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill.
Magnetic inspection equipment

Magnatrol Valve Corp., 52 Beekman St., New York 7, N. Y.
Valves

Magnavox Co., Inc., 2131 Bueter Rd., Fort Wayne 2, Indiana
Electrolytic capacitors

Magnetic Analysis Corp., 42-44 12th St., Long Island City 1, N. Y.
Magnetic inspectors for uniform cross-sectional steel

Magnetic Gauge Co., 60 E. Bartges St., Akron 11, Ohio
Continuous gages, sheet & strip

Magnetostriction Devices Co., 739 Boylston St., Boston, Mass.
Magnetostriction galvanometers

Magnetrol, Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.
Flow and level controls

Magnus Brass Mfg. Co., 533 Reading Rd., Cincinnati 2, Ohio
Liquid level gages

Mallory & Co., Inc., P. R., 3029 E. Washington St., Indianapolis 6, Ind.
Capacitors, relays & switches

Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn.
Thermometers, glass, dial & recording; controllographs; indicating & recording controllers; diaphragm motor valves; tachometers, barometers; & hygrometers

Mansfield & Green, 1051 Power Ave., Cleveland 14, Ohio
Gages and dead weight testers

Marine Compass Co., Pembroke, Mass.
Marine instruments

Marion Electrical Instrument Co., Manchester, N. H.
Electrical indicating instruments

Maris Co., John M., 528 Arch St., Philadelphia 6, Pa
Laboratory apparatus

Marsh Corp., Jas. P., 2063 Southport Ave., Chicago 14, Ill.
Indicating gages, recording gages, dial thermometers, recording thermometers, refrigeration service instruments, temperature controlling systems, valves for heating systems
(See advertisements on pages 42, 97)

Marshall Co., C. & E., 1445 West Jackson Blvd., Chicago 80, Ill.
Manufacturers & distributors of jewelers, watchmakers & engravers supplies

Marshall Co., L. H., 270 W. Lane Ave., Columbus, Ohio
Laboratory furnaces

Marshalltown Mfg. Co., Marshalltown, Iowa
Pressure gages & indicating thermometers

Martin-Hubbard Corp., 11 Beacon St., Boston 8, Mass.
Designers of electrical, mechanical and optical instruments
(See advertisement on page 23)

Martindale Electric Co., 1352 Hird Ave., Cleveland, Ohio
Insulation testers

Mason-Neilan Regulator Co., 1190 Adams St., Boston 24, Mass.
Industrial control equipment for pressure temperature, flow, liquid level, combustion & ratio, diaphragm control valves; pressure & vacuum regulators; level controllers; pump speed governors; pump pressure regulators; pipe strainers
(See advertisement on page 27)

Massa Laboatories, Inc., 3868 Carnegie Ave., Cleveland 15, Ohio
Acoustic instruments, sound pressure measurement standards

Master Electric Co., Dayton, Ohio
Fractional horsepower motors

Matthews Instrument Co., 1129 Boylston St., Newton Upper Falls, Mass.
Odometers

Maurer, Inc., J. A., 37-01 31 St., Long Island City, 1, N. Y.
Motion picture cameras

Maveg Machine Sales Association, Chamber of Commerce Bldg., Long Island City, N. Y.
Dilatometers, dual comparators

MODEV

LET US
PROVIDE YOUR INDUSTRY
WITH
CONTROL THROUGH

CUSTOM

DESIGNED
DEVELOPED
BUILT

INSTRUMENTS

AND ASSOCIATED
EQUIPMENT

DEVELOPMENT, DESIGN,
ENGINEERING & STYLING
IN

ELECTRICAL MECHANICAL
ELECTRONIC HYDRAULIC

PRODUCTS -:- PROCESSES

MODEV CO.

DAYTON 6, OHIO

Maymer Corp., 10884 Berea Rd., Cleveland 2, Ohio
Scales, dials & templates

M B Instruments, Inc., 331 East St., New Haven 11, Conn.
Electrical instruments
(See advertisement on page 15)

McAlear Mfg. Div. of Climax Ind., Inc., 1911 S. Western Ave., Chicago 8, Ill.
Manual & automatic controls for air, oil, gas, steam, chemicals, pure food, acid & alkali

McDonnell & Miller, 400 N. Michigan, Chicago 11, Ill.
Boiler controls

McDonnell Odometer Co., 3501 So. Kedzie Ave., Chicago 32, Ill.
Counters

McFarlin Co., 29 West Marion Ave., Youngstown 2, Ohio
Leak detectors

McKesson-Doster-Northington Co., 1706 First Ave., Birmingham 3, Ala.
Laboratory supplies

McNab of Bridgeport, Inc., Bridgeport, Conn.
Marine appliances, torsionmeters, salinity indicators, revolution counters

McNeill Engineering Co., 4057 West Van Buren St., Chicago 24, Ill.
Smoke alarms

Measurements Corp., Boonton, N. J.
Radio Frequency Testing & Measuring Devices
(See advertisements on pages 47, 58, 84, 106)

Mechanical Industries Production Co., 209 Ash St., Akron 3, Ohio
Thermostats

Melborn Electric Co., P. O. Box 240, Melrose Park, Ill.
Photoelectric controls

Meletron Corp., 950 N. Highland Ave., Los Angeles 38, Calif.
Pressure operated switches

Mellaphone Corp., 714 University Ave., Rochester 2, N. Y.
Rectifiers

Mercoid Corp., 4233 Belmont St., Chicago 14, Ill.
Automatic controls for heating, refrigeration, air conditioning, & various industrial applications
(See advertisement on page 27)

Mercon Regulator Co., 2357 N. 29th St., Milwaukee 10, Wisc.
Power plant specialties in regulation of pressure, level, rate of flow, proportioning & temperature

Mercury Glass Co., Pleasantville, N. J.
Glass tubing

Meriam Instrument Co., 10920 Madison Ave., Cleveland 2, Ohio
Manometers, draft gages, indicating flow meters for steam, oil, gas, air, water, tank liquid level gages
(See advertisements on pages 36, 40, 52, 54)

Meridian Instrument Co., 303 Fourth Ave., New York 10, N. Y.
Chronometers

Merit Coil & Transformer Corp., 4427 No. Clark, Chicago 40, Ill.
Transformers, coils & reactors, electrical windings

Merkle Korff Gear Co., 214 North Morgan St., Chicago 7, Ill.
Motorized speed reducers: induction, synchronous, reversing, d-c., universal motors

Merrick Scale Mfg. Co., Autumn St., Passaic, N. J.
Automatic continuous weighing machines

Merritt Engg. & Sales Co., Inc., 120 So. Niagara St., Lockport, N. Y.
Consistency controls

Merz Engineering Co., 200 S. Harding St., Indianapolis 7, Ind.
Gages & gaging fixtures

Meter Devices Co., 1001 Prospect Ave., S. W., Canton 6, Ohio
Electrical test devices

Meters, Incorporated, 915 Riveria Dr., Indianapolis 5, Ind.
Electrical indicating instruments

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.
High frequency amplifiers, electric instruments, oscillators, radio remote control systems, comparator gages, electric tachometers, timers, chronographs

Metzger & Son, F. F., 2600 N. 6 St., Philadelphia 33, Pa.
Extensometers

Meyer Scientific Supply Co., Inc., 76 Willoughby St., Brooklyn 1, N. Y.
Laboratory apparatus

Meyer Governor Co., 284 Baker Bldg., Minneapolis 2, Minn.
Long-distance recording, indicating, and contact-making instruments; gage pulsation protectors

Meylan Stopwatch Corp., 264 West 40th St., New York 18, N. Y.
Stop watches

M-G Gage Co., 637 South West St., Syracuse 4, N. Y.
Snap gages

Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.
Precision devices in industrial & scientific fields
(See advertisement on page 32)

Microchemical Service, 30 Van Zandt Ave., Douglaston, N. Y.
Microchemical laboratory apparatus

Micro Master Co., 2733 N. Pulaski Rd., Chicago 39, Ill.
Dial indicators & taper gages

Microstat Corp., P. O. Box 126, Norwalk, Conn.
Photographic equipment for use in microfilming industry

Micro Switch Div., First Industrial Corp., Spring St., Freeport, Illinois
Snap action switches

Mid-West Dynamometer & Engg. Co., Western Ave., at 60 St., Chicago 29, Ill.
Dynamometers

Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Radio test instruments

Miller Transformer Co., B. F., P. O. Box 568, Trenton 4, N. J.
Transformers

Millers Falls Co., Greenfield, Mass.
Machine shop gages

Milton Roy Pumps, 1330 E. Mermaid Ave., Philadelphia 18, Pa.
Automatic feeders & flow controllers

Milwaukee Gas Specialty Co., 2025 W. Clybourn, Milwaukee 3, Wis.
Valves, fittings & safety shut-offs for gas fired equipment

Milwaukee Lock Mfg. Co., 732 W. Virginia St., Milwaukee 4, Wis.
Governors, tachometers

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Instruments for the detection, analysis & recording of toxic and combustible gases; instruments for sampling, counting & measuring dust particles
(See advertisement on page 13)

Mine & Smelter Supply Co., 1422-17th St., Denver, Colo.
Industrial equipment & supplies

Mineraliac Electric Co., 25 N. Peoria St., Chicago 7, Ill.
Potential detectors

Minneapolis Elec. & Construction Co., 80 South 12th St., Minneapolis 4, Minn.
Wire length measuring machines

Minneapolis-Honeywell Reg. Co., 2727 - 4 Ave., S. Minneapolis 8, Minn.
Heating, ventilating and air conditioning control equipment; thermostats; safety controls; motor and diaphragm operated valves; relays; furnace controllers

Model Engineering & Mfg. Co., Huntington, Ind.
Resistors

Modern Controls, Inc., 176 W. Adams St., Chicago 3, Ill.
Constant current regulators

Modern Kiln & Furnace Co., American & Y[illegible] Streets, Philadelphia 33, Pa.
Ovens, furnaces & controllers

Modern Product Development Co., 2039 S[illegible] Ave., Dayton 6, Ohio
Aircraft instruments

Modev Co., 2039 Salem Ave., Dayton 6, O[illegible]
(See advertisement on page 118)

Moeller Instrument Co., 132nd St. & 8[illegible] Ave., Richmond Hill, N. Y.
Thermometers, hydrometers, etc.
(See advertisement on page 93)

Mogey & Sons, Inc., William, Interhaven A[illegible] Plainfield, N. J.
Optical testing instruments and optical p[illegible]

Moist-O-Meter, Inc., Board of Trade Bldg., Kansas City, Mo.
Moisture testers

Moisture Register Co., 133 N. Garfield Ave., Alhambra, Cal.
Moisture testing instruments & devices

Moline Furniture Works, Moline, Ill.
Laboratory furniture

Monarch Manufacturing Co., 2014 N. Major Ave., Chicago 39, Ill.
Radio set testers

Monarch Manufacturing Works, Inc., Salmon & Westmoreland Sts., Philadelphia, Pa.
Strainers, oil burner nozzles & regulating valves, viscosimeters

Monitor Controller Co., Gay, Lombard & Frederick Sts., Baltimore 2, Md.
Electrical controllers

Montgomery Mfg. Co., Dept. 296, 549 W. Washington Blvd., Chicago 6, Ill.
Program clocks

Moore Products Co., 901 E. Lycoming St., Philadelphia 24, Pa.
Industrial instruments

Morehouse Machine Co., York, Penna.
Proving rings

Mosher Electronic Control Systems, 130 W. 42 St., New York 18, N. Y.
Electronic bin level indicators & electronic load regulators for pulverizing machinery

Mossman, Inc., Donald P., 612 N. Michigan Ave., Chicago 11, Ill.
Switches

Mott-Smith Corp., 1911 W. Alabama, Houston 6, Tex.
Geophysical instruments

Multipot Division, 329 East Second St., Los Angeles 12, Calif.
Rheostats
(See advertisement on page 79)

Municipal Instrument Co., 3246 S. Cuyler Ave., Berwyn, Ill.
Magnetic dipping needles, pipe phone for checking leaks

Munsell Color Co., Inc., 10 E. Franklin St., Baltimore 2, Md.
Color comparators

Mu-Switch Corp., 38 Pequit St., Canton, Mass.
Snap action switches

N

Nashville Surgical Supply Co., 401 Church St., Nashville 3, Tenn.

Nason Co., 7663 Epworth Blvd., Detroit 4, Mich.
Controllers & testing devices

Nathan Mfg. Co., 250 Park Ave., New York 17, N. Y.
Valves

National Brass Co., 1600 Madison St., S. E., Grand Rapids 2, Mich.
Combustion & draft controllers

National Carbon Co., Inc., Carbon Products Div., P. O. Box 6087, Cleveland 1, Ohio
Accelerated weathering testers

National Co., Inc., 61 Sherman St., Malden, Mass.
Capacitors and radio instruments

National Electric Controller Co., 5305 Ravenswood Ave., Chicago 40, Ill.
Rheostats

National Engineering Products, Inc., Commerce & Savings Bldg., Washington 4, D. C.
Pressure gage equalizers

National Instrument Co., 246 Walnut St., Newtonville 60, Mass.
Electro-mechanical instruments & devices

National Meter Co., 4207 First Ave., Brooklyn, N. Y.
Water, oil & gasoline meters

National Photocolor Corp., 305 E. 43rd St., New York 17, N. Y.
Scientific cameras, densitometers

National Research Corp., 100 Brookline Ave., Boston 15, Mass.
Optical products, high vacuum apparatus

National Scientific Corp., 2141 W. North Ave., Chicago 47, Ill.
Laboratory supply house

National Technical Labs., 820 Mission St., South Pasadena, Calif.
Beckman pH instruments and electro-metric pH equipment for completely automatic indication, control & recording of pH in large scale industrial processes

National Time & Signal Corp., 21800 Wyoming Ave., Detroit 20, Mich.
Timers for welding & industrial process control

Natural Gas Equipment Inc., 541 Petroleum Securities Bldg., Los Angeles, Calif.
Furnace controllers

PANELLIT

Contracting Engineers for

Centralized Process Control Systems

Alarm and Signal Systems

Prefabricated Control Units

PANELLIT, INC.

225 N. MICHIGAN AVE. CHICAGO 1, ILLINOIS

Nixon Utilities Corp., 3600 W. Touhy Ave., Chicago 45, Ill.
Instrument cleaning machines
Nqus, T. S. & J. D., 69 Pearl St., New York 4, N. Y.
Nautical instruments
Nelson Section Liner Co., 229 W. Gardner St., DeKalb, Ill.
Drawing instruments
Nelson Vacuum Pump Co., Geo. F., 2133 4th St., Berkeley 2, Calif.
High vacuum pumps
Neptune Meter Co., 50 W. 50th St., New York 20, N. Y.
Liquid meters
Noster Company, Inc., L. G. Millville, N. J.
Oxygen regulators
Newark Wire Cloth Co., 336 Verona Ave., Newark N. J.
Testing sieves
New Hampshire Ball Bearings, Inc., 2 Main St., Peterborough, N. H.
Miniature ball bearings
N. J. Laboratory Supply Co., 235 Plane St., Newark, N. J.
Laboratory supplies
New Jersey Meter Co., Plainfield, N. J.
Compressed air meters, separators for removing water & oil from compressed air lines, liquid flow indicators with low flow signaling circuit
(See advertisement on page 34)
N. Y. Laboratory Supply Co., Inq., 630 Broadway New York 12, N. Y.
Laboratory supplies
New York Scientific Supply Co., 111 East 22nd St., New York, N. Y.
Laboratory supplies
New York Transformer Co., 39 Chambers St., New York 7, N. Y.
Transformers
Newark Scale Works, 10-12 Hobson St., Newark 8, N. J.
Scales
Newark Wire Cloth Co., 336 Verona Ave., Newark, N. J.
Sieves
Niagara Electrical Instrument Co., 559 Ellicott St., Buffalo, N. Y.
Electrical power analyzer
Nieboff & Co., C. E., 4925 Lawrence Ave., Chicago 30, Ill.
Auto test equipment
Nordstrom Valve Division of Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Valves
Norcross Corporation, 50 Hunt St., Watertown, Mass.
Humidity controllers and recording viscosimeters
Noris Instruments, Ltd., 105 E. 29th St., New York, N. Y.
Drawing instruments
North American Instrument Co., 10-12 Van Cortland Ave., E., Bronx 58, N. Y.
Aircraft instruments
North American Manufacturing Co., 4455 E. 71st St., Cleveland 5, Ohio
Valves and valve operating devices
(See advertisement on page 103)
North American Phillips Co., Inc., 100 E. 42nd St., New York 17, N. Y.
X-ray equipment
Northern Equipment Company, 1945 Grove Drive, Erie, Pa.
Boiler feed control
Northwest Instrument Co., 63 Madison St., Seattle, Wash.
Compasses
Norton Electrical Instrument Co., 83 Hilliard St., Manchester, Conn.
Electrical instruments.
Norwalk Valve Co., South Norwalk, Conn.
Valves
Nosker Engineering Products, Yellow Springs, Ohio
Phase indicators
Nothelfer Winding Laboratories, 109 Albemarle Ave., Trenton 3, N. J.
Transformers
Nurnberg Thermometer Co., Inc., 124 Livingston St., Brooklyn 2, N. Y
Thermometers & Hydrometers
Nye, Inc., Wm. F., New Bedford Mass.
Instrument and watch oils

O

Ohio Injector Co., 3 Main St., Wadsworth, Ohio
Check valves
Ohmite Mfg. Co., 4826 W. Flournoy St., Chicago 44, Ill.
Close control rheostats, fixed & adjustable power resistors, precision & non-inductive resistors, attenuators, tap switches and R. F. chokes.
(See advertisement on page 81)
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia 23, Pa.
Testing machines
Omega Machine Co., 3409 E. 18 St., Kansas City, Mo.
Chemical feeding equipment for dry or liquid materials, by volume or by weight
Optron Laboratory, 2655 Salem Ave., Dayton 6, Ohio
Optical flats, reflectors, prisms
(See advertisement on page 33)
Orton Jr., Ceramic Foundation, Edward, 1445 Summit St., Columbus 1, Ohio
Seger cones
Oster Mfg. Co., John, Terminal Bldg., 1 Main St., Racine, Wis.
Fractional horsepower motors

P

Pacific Biological Labs., Pacific Grove, Calif.
Laboratory supplies
Pacific Scientific Co., Inc., 1430 Grande Vista Ave., Los Angeles 23, Calif.
Cable tension indicator
Packard Engineering Co., 137 Vernon Ave., Brooklyn 6, N. Y.
Liquid level indicators
Palmer Thermometers, Inc., 2511 Norwood Ave., Cincinnati, Norwood 12, Ohio
Industrial indicating "Red-Reading-mercury" thermometers & dial thermometers
(See advertisement on page 97)
Palo-Myers, Inc., 81 Reade St., New York 7, N. Y.
Laboratory supplies & boiler water testing equipment
Palos Optical Co., Box 6, Palos Hts., Ill.
Astronomical instruments, filters, optical flats, lenses, microscopes
Panellit, Inc., 225 N. Michigan Ave., Chicago, Ill.
Instrument panels, pressure indicators
(See advertisement on page 119)
Panoramic Radio Corp., 245 W. 55th St., New York, N. Y.
Electronic instruments and inspection devices
Paragon Electric Co., Two Rivers, Wis.
Timers
Park Sales Co., 421 Canal St., New York 13, N. Y
Micrometers and calipers
(See advertisement on page 20)
Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio
Pressure snubbers, valves, fittings for instrument tubing
Parks Co., Harry S., 101 North 33 St., Philadelphia, Pa.
Gages, pressure instruments
Parks-Cramer Co., Fitchburg, Mass.
Humidity, heat & air change control, wet bulb temperature regulators

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DIALS, PANELS & PLATES
Premier Dials, Panels and Nameplates combine maximum utility with the added PLUS of sales appeal. Sharp, clear and accurate! Rich colors and "baked-in" finishes! Premier metal products reflect this superiority in increased sales for you.
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• Bronze
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43-21 21st STREET, LONG ISLAND CITY 1, N. Y.

Parr Instrument Co., 222 52nd St., Moline, Ill.
Combustion bombs, calorimeters, hydrogenation apparatus, melting point apparatus

Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Temperature indicators & controllers, time delay relays

Passaic Analytical Laboratories, Inc., 228 Ayerigg Ave., Passaic, N. J.
Instrument cleaning machines
(See advertisement on page 50)

Pastor Stop Watch Co., 43 East Main St., Waterbury 22, Conn.
Stop watches

Patterson Screen Div., E. I. duPont de Nemours & Co., Towanda, Pa.
X-ray intensifying and fluorscopic screens

Paulson & Co., Henry, 37 So. Wabash Ave., Chicago 3, Ill.
Watch checking instruments, horological & instrument tools & supplies

Paulstick & Sons, H., 2124 Fulton St., Brooklyn 33, N. Y.
Thermometers

Penberthy Injector Co., 1242 Holden St., Detroit 2, Mich.
Liquid level gages

Penn Electric Switch Co., Box 556, Goshen, Ind.
Automatic controls for pressure, temperature, humidity, liquid level; also mechanically actuated unit switches. Specialized controls for refrigeration, air conditioning, heating, pumps, air compressors

Penn Industrial Instrument Corp., 3116 N. 17th St., Philadelphia 32, Pa.
Flow meters
(See advertisement on page 55)

Penn Optical & Inst. Co., 50 S. San Gabriel Blvd., Pasadena 8, Calif.
Optical parts

Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.
Automatic temperature controls for oil burners, stokers, gas burners, refrigeration & air conditioning

Perkin-Elmer Corp., 535 Hope St., Glenbrook, Conn.
Optical instruments

Perkins & Son, Inc., B. F., Holyoke, Mass.
Testers for leather, paper & textiles
(See advertisement on page 88)

Perno Incorporated, 6415 Ravenswood Ave., Chicago 26, Ill.
Instrument pivots & Contacts
(See advertisement on page 67)

Permutit Company, 330 West 42nd St., New York 18, N. Y.
Indicators & recorders for CO_2, specific gravity of natural, manufactured or process gases, exhaust gas analysis, other uses where gas density guides operation

Petrometer Corp., 1 Star Square, Long Island City 1, N. Y.
Distant reading, liquid level tank gages

Pfaltz & Bauer, Inc., 350 5th Ave., New York 1, N. Y.
Laboratory control instruments

Philadelphia Thermometer Co., 6th and Cayuga Sts., Philadelphia 40, Pa.
Instruments for temperature indication, control & regulation
(See advertisement on page 94)

Phillips Manufacturing Co., 3475 W. Touhy Ave., Chicago, Ill.
Vapor degreasers & instrument cleaning machines

Phipps and Bird, Inc., 6th & Bird Sts., Richmond 5, Va.
Laboratory apparatus & chemicals

Phoenix Precision Instrument Co., 3803 N. 5th St., Philadelphia 40, Pa.
Laboratory equipment

Photoswitch, Inc., 77 Broadway, Cambridge, Mass.
Industrial photoelectric controls including counting equipment, electronic timers & special electronic controls, smoke controls

Photovolt Corp., 95 Madison Ave., New York 16, N. Y.
Photo-electric elements, photometers, electronic timing devices, photo-electric colorimeters, photo-electric exposure meters, densitometers

Physicists Research Co., 321 S. Main St., Ann Arbor, Mich.
Specialists in solution of unusual industrial research jobs, with special experience in machinery noise reduction, development of special instruments, & measurement of surface irregularities

Picker X-Ray Corp., 300 Fourth Ave., New York 10, N. Y.
X-ray equipment

Pickering Governor Co., Pickering St., Portland, Conn.
Governors

Pierce Watch Company, 22 West 48th St., New York 19, N. Y.
Stop watches

Pike & Co., E. W., Elizabeth 13, N. J.
Illuminated magnifiers & microscopes

Pioneer Case Co., 733 Broadway, New York 3, N. Y.
Instrument cases
(See advertisement on page 20)

Pipe Machinery Co., 930 E. 70th St., Cleveland Ohio
Inspection gages

Pitometer Log Corp., 206 Lafayette St., New York 12, N. Y.
Pilot tube flowmeters

Pittsburgh Instrument & Machine Co., 1[illegible] Reedsdale St., Pittsburgh 12, Pa.
Brinell Machines, alternating impact ma[illegible]s, surveying instruments
(See advertisement on page 88)

Plumb Co., Inc., D. S., 73-77 Norfolk St., Newark 4, N. J.
Pressure gage movements
(See advertisement on page 39)

Plummer & Kershaw, 2757 Frankford Ave., Philadelphia 34, Pa.
Optical parts
(See advertisement on page 6)

Pneumercator Co. Inc., 305 E. 6th St., New York 17, N. Y.
Level indicators

Polarad Electronics Co., 135 Liberty St., New York 6, N. Y.
Amplifiers, audiofrequency equipment, oscillators, remote control equipment

Polarized Light-Photoelastic Co., 557 W. 124 St., New York 27, N. Y.
Photoelastic polariscopes

Polarizing Instrument Co., 41 E. 42nd St., New York, N. Y.
Photoelasticity apparatus

Pomeroy Stereograph Co., 303 Empire Bldg., Cleveland, Ohio
Drawing instruments

Poole Manufacturing Engineers, 1816 Magnolia St., Dallas 1, Texas
Tube inside micrometer for big gun internal measurements and refinery still tubes

Porter, George K., Hatboro, Pa.
Scales
(See advertisement on page 47)

Positel Manufacturing Co., 4 Indian Rock Path, Berkeley 7, Cal.
Remote indicating liquid level gages

Post Company, Frederick, P. O. Pox 803, Chicago 90, Ill.
Instruments & equipment for architect & engineer

Potter & Brumfield Sales Co., 549 W. Washington St., Chicago 6, Ill.
Relays

Potter Co., 1950 Sheridan Rd., North Chicago, Ill.
Automotive service instruments

Potter Instrument Co., 136 Roosevelt Ave., Flushing, N. Y.
Photoelectric counters and controls

Powers Regulator Co., 2734 Greenview Ave., Chicago 14, Ill.
Controls for air conditioning temperature & humidity; also water temperature controls, dial indicating & recording thermometers & steam traps.
(See advertisement on page 29)

Pratt & Whitney, Div. Niles-Bement Pond Co., West Hartford, Conn.
Machine shop instruments

Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.
Radio test instruments

Precision Gage & Tool Co., 320 East 3rd St., Dayton 2, Ohio
Machine shop gages

Precision Metal Turning Co., 534 West Broadway, New York 12, N. Y.
Metal turning, dials, screw machine parts, metal stampings

Precision Resistor Co., 334 Badger Ave., Newark 8, N. J.
Resistors

Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill.
Standard & custom-built laboratory equipment

Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.
Scientific instruments
(See advertisement on page 98)

Precision Tube Company, 3824-26-28 Terrace St., Philadelphia, Pa.
Fine tubing & metal shielded wire
(See advertisement on page 101)

Preferred Utilities Mfg. Corp., 31 West 60th St., New York 23, N. Y.
Boiler plant instruments

Premier Crystal Laboratories, Inc., 63 Park Row, New York 7, N. Y.
Piezo electric quartz and tourmaline crystals, reactance & capacity meters

Premier Metal Etching, 21-03 44th Ave., Long Island City 1, N. Y.
Instrument dials & scales; nameplates & panels
(See advertisement on page 120)

Process Controls Co., 2 East End Ave., New York 21, N. Y.
Designers and builders of electrical, mechanical and electronic controls for automatic equipment and processes

Production Instrument Co., 710 W. Jackson Blvd., Chicago 6, Ill.
Electric & mechanical counting, timing & recording devices & actuating switches
(See advertisement on page 30)

Proportioneers, Inc., 152 Codding St., Providence 1, R. I.
Automatic controlling & proportioning equipment

Pyle National Co., 1334 N. Kostner Ave., Chicago 51, Ill.
Connectors

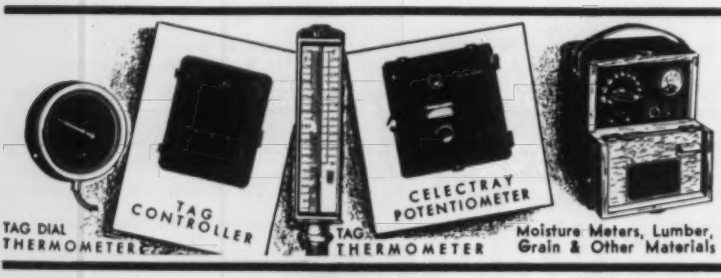
Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y.
Pyrometers for various purposes
(See advertisement on page 73)
Pyrometer Service Co., 228 River Rd., Arlington, N. J.
Pyrometer tubes, thermocouples

R

Racine & Co., Jules, 20 West 47th St., New York 19, N. Y.
Stop watches
(See advertisement on page 22)
Radiation Counter Labs., 1457 E. 57 St., Chicago 37, Ill.
Geiger-Muller counters, radium detectors
(See advertisement on page 74)
Radio City Products Inc., 127 W. 26th St., New York 1, N. Y.
Electrical & radio testing instruments & accessories
Radio Frequency Laboratories, Inc., Boonton, N. J.
Electronic equipment
Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.
Radio test instruments, remote control systems
Rahm Instruments, Inc., 12 W. Broadway, New York 9, N. Y.
Direct reading oscillographs & strip chart recorders
Raco, Inc., 601 West Fifth Ave., Columbus 1, Ohio
Refrigeration controls
Racher & Betzold, Inc., 730 N. Franklin St., Chicago 10, Ill.
Laboratory supplies
Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.
Amplifiers, audio-frequency equipment, variable capacitors, photoelectric cells, microphones
Rawson Electrical Instrument Co., 112 Potter St., Cambridge, Mass.
Dynamometers, wattmeters, milliameters & voltmeters. Also ultra-sensitive meters both for A.C. & D.C., fluxmeters, electrostatic voltmeters, Thermocouples in vacuum, earth current meters, cable testers, milli-second timers
Ray Control Div., Lane-Wells Co., 717 N. Lake Ave., Pasadena 19, Calif.
Spectrographs
Ray-O-Vac Company, Madison 3, Wis.
Dry batteries
Raytheon Mfg. Co., Special Purpose Tube Section, 55 Chapel St., Newton, Mass.
Automatic & manually controlled rectifiers for all communication, industrial or laboratory applications
Raytron, Inc., 407 N. Jackson St., Jackson, Mich.
Electrical resistance pressure recorders
RCA Division, Radio Corporation of America, Camden, N. J.
Radio & electronic equipment for all purposes including laboratory & industrial apparatus
Read Machinery Co., Inc., York, Penna.
Chemical and industrial equipment
Redington Co., F. B., 101 Sangamon St., Chicago 7, Ill.
Counters: production, revolution, stroke
Reed Small Tool Works, 40 Dewey St., Worcester 2, Mass.
Machine shop micrometers
Refinery Supply Co., 621 East Fourth St., Tulsa, Okla.
Gas testing instruments & specialties for oil & gas industry; & laboratory supplies
(See advertisement on page 48)
Refrigerating Specialties Co., 728 So. Sacramento Blvd., Chicago 12, Ill.
Automatic valves and regulators
Reiner Electronics Co., 152 W. 25th St., New York 1, N. Y.
Electronic testing equipment
Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio
Steam specialties
Reliance Instrument Co., 3027 W. Van Buren St., Chicago 22, Ill.
Electrical indicating instruments
Republic Flow Meters Co., 2240 Diversey Parkway, Chicago 47, Ill.
Remote reading flow meters, complete line of power plant & industrial instruments for the measurefent of flow, level, pressure, draft, temperature & CO_2. Automatic boiler controls, regulators, valves and desuperheaters
Resistance Products Co., 714 Race St., Harrisburg, Pa.
Resistors
Resistors, Inc., 2149 Indiana Ave., Chicago 16, Ill.
Resistors, adjustable, variable & wire wound
Reveo, Inc., Deerfield, Mich.
Sub zero test cabinets
Revere Corporation of America, P. O. Box 304, Wallingford, Conn.
Thermocouples for liquids, air, metal, hot gases, thermocouple wire, harnesses and leads. Pitot tubes (shielded and unshielded). Engine & Flight test recording accessories
Rex Rheostat Co., 3 Foxhurst Rd., Baldwin, L. I., N. Y.
Protected and unprotected slide-contact rheostats & adjustable, wire wound resistors
(See advertisement on page 79)
Reynolds Gas Regulator Co., Anderson, Ind.
Automatic valves & regulators
Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford 6, Conn.
Time switches
Richards, Arklay S. Co., Inc., 52 Winchester St., Newton Highlands, Mass.
Thermocouples, lead wire & protection tubes
Richards Machine Tool Co., 124 S. Isabel St., Glendale 5, Calif.
Richardson-Allen Corp., 15 W. 20 St., New York, N. Y.
Timers and time switches
Richardson Scale Co., Clifton, N. J.
Automatic weighing machinery
Richle Testing Machine Division, American Machine & Metals Inc., East Moline, Ill.
Testing machines & testing instruments for tension, compression, bending, torsion, shear, hardness, wear
Rieker Instrument Co., 1919 Fairmount Ave., Philadelphia 30, Pa.
Scientific instruments
Riverbank Laboratories, Geneva, Ill.
Tuning forks
R & M Mfg. Co., Royal Oak, Mich.
Machine shop gages
Robertshaw Thermostat Co., Youngwood, Pa.
Thermostats
Robertson & Co., John H., 1767 W. Armitage Ave., Chicago 22, Ill.
Robertson, 3rd, J. L., 116 Broad St., New York, N. Y.
Engine indicator accessories
Robinette Co., W. C., 802 Fair Oaks Ave., S. Pasadena, Cal.
Automatic control devices
Robinson Optical Co., 3048 Rodman St., N. W., Washington, D. C.
Optical flats, mirrors, prisms & lenses
Robinson Orifice Fitting Co., 1435 Santa Fe Ave., Los Angeles 31, Calif.
Orifice fittings & plates
Rochester Mfg. Co., Inc., Rockwood St., Brighton, Rochester, N. Y.
Pressure & liquid level indicators & thermometers
Rockwell Co., Stanley P., 296 Homestead Ave., Hartford 5, Conn.
Dilatometers
Rockwell Mfg. Co., 400 Lexington Ave., Pittsburgh, Pa.
Fluid meters
(See advertisement on page 54)
Roemer Drug Co., 606 N. Broadway, Milwaukee 4, Wis.
Laboratory supply house
Rogear Co., 11 Water St., New York 4, N. Y.
Paints which change colors with temperature
Roller-Smith Co., 1766 N. Market St., Bethlehem, Pa.
Instruments (indicating & graphic), air & oil circuit breakers, relays, switchboards, precision balances, transformers, instrument & control switches
Rollin Co., 2070 N. Fair Oaks Ave., Pasadena 3, Calif.
Electronic test equipment
Roth Brothers Chronometer Co., 104 E. 23 St., New York 10, N. Y.
Marine chronometers, sextants, torpedo boat watches
Rowe Radio Research Laboratory Co., 2422 N. Pulaski Road, Chicago 39, Ill.
Specialized industrial & laboratory equipment, Electro-mechanical & electronic devices
R-S Products Corp., 4523 Germantown Ave., Philadelphia 44, Pa.
Butterfly valves & heat treating furnaces
Rubicon Co., Ridge Ave. at 35th St., Philadelphia 32, Pa.
Precision electrical instruments: potentiometers, galvanometers, bridges, resistance standards, for standardization, research, calibration of meters, production testing, & educational applications. Photoelectric colorimeters, transmission dynamometers & other special apparatus
Rudolph & Sons, O. C., P. O. Box 446, Caldwell, N. J.
Optical instruments
Rueckert Manufacturing Co., 83 King St., E. Greenwich, R. I.
Cases for instruments
Ruehfel Co., Inc., George, 93-08 95 Ave., Ozone Park, N. Y.
Laboratory instruments & apparatus
Rupp & Bowman Co., 315 Superior St., Toledo 3, Ohio
Laboratory supplies
Ruska Instrument Corp., 4607 Montrose Blvd., Houston 6, Texas
Geophysical instruments
Rutteo Mfg. Co., 103-04 Metropolitan Ave., Forest Hills, N. Y.
Ryan Recording Thermometer Co., 654 Mill St., Los Angeles 21, Calif.
Bimetalic thermostat recording thermometer
Ryan Tool & Engineering Co., 19159 John R St., Detroit 3, Mich.
Height gages, fixtures, special machinery.

S

Saftee Glass Co., Stenton Ave., Philadelphia 44, Pa.
Glass, low-reflecting surfaces
Sampsel Time Control, Inc., Spring Valley, Ill.
Combustion control equipment
Sanborn Co., 39 Osborne St., Cambridge, Mass.
Electronic instruments
Sangamo Electric Company, 1022 Converge Ave., Springfield, Ill.
Electric meters of all types; also instrument transformers, time switches & radio condensers
Sarco Company, Inc., 475 5th Ave., New York 17, N. Y.
Temperature regulators
Sargent & Co., E. H., 155 E. Superior St., Chicago 11, Ill.
Laboratory supplies & chemicals
Schaar & Co., 754 W. Lexington St., Chicago 7, Ill.
Laboratory supplies
Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia 33, Pa.
Automatic valves
Schaefer Bros. Co., 1059 W. 11th St., Chicago 7, Ill.
Rheostats
Schaevitz Engg., 226 Harding Ave., Collingswood, N. J.
Accelerometers, extensometers, position indicators, remote metering equipment
Schaffer Poidometer Co., 2828 Smallman St., Pittsburgh 22, Pa.
Scales
Schauer Machine Co., 2060 Reading Rd., Cincinnati 2, Ohio
Battery chargers, battery eliminators and rectifiers
Scherr Co., Inc., George, 200 Lafayette St., New York 12, N. Y.
Optical measuring and inspection equipment
Schneider-Cogswell, Inc., 1849 Halstead St., Chicago 14, Ill.
Inspection devices
(See advertisement on page 55)
Schottland, Frederic D., 82-62 Grenfell Ave., Kew Gardens, N. Y.
Accelerometers, vacuum-tube voltmeters
Schutte & Koerting Co., 12th & Thompson Sts., Philadelphia 22, Pa.
Rotameters
Schwein Engg. Co., L. N., 5736 Washington Blvd., Los Angeles, Calif.
Aircraft instruments & pressure control instruments
Schweitzer & Conrad, Inc., 4435 Ravenswood Ave., Chicago 40, Ill.
High voltage testers, voltage detectors, & temperature indicators
Scientific Apparatus Co., 4 Landscape Ave., Yonkers 5, N. Y.
Laboratory apparatus
Scientific Glass Apparatus Co., Inc., 49 W. Ackerman St., Bloomfield, N. J.
Glass apparatus & interchangeable ground glass joints
Scientific Instrument Co., 1441 Walnut St., Berkeley, Calif.
Current meters
Scientific Instrument Co., 307 W. Congress St., Detroit 26, Mich.
Industrial & laboratory thermometers; hydrometers; special laboratory apparatus
Scientific Supplies Co., 123 Jackson St., Seattle 4, Wash.
Laboratory supplies
Scott Co., Henry L., Blackstone & Culver Sts., Providence 1, R. I.
Physical testing machines
Seedburo Equipment Co., 618 W. Jackson Blvd., Chicago, Ill.
Moisture testers, ovens, scales, thermometers
Seederer-Kohlbusch, Inc., 27-29 S. Van Brunt St., Englewood, N. J.
Analytical balances & weights
Seely Instrument Co., Inc., 377 4th St., Niagara Falls, N. Y.
Controllers & valves
Selas Co., Erie Ave. & D St., Philadelphia 34, Pa.
Indicating flow meters
Sell Electric Co., H. H., 1907 Willow Ave. N., Minneapolis 11, Minn.
Phase sequence indicators
(See advertisement on page 66)
Selsi Co., Inc., 43 W. 23rd St., New York 10, N. Y.
Optical goods, scientific instruments
Selenium Corp., 2160 E. Imperial Highway, El Segundo, Calif.
Rectifiers and photoelectric cells
Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Electrical instruments measuring quantities or values of small current or voltage
Serdex, Inc., 91 Cambridge St., Boston 14, Mass.
Meteorological instruments
(See advertisement on page 49)
Service Recorder Co., 1375 Euclid Ave., Cleveland, Ohio
Vehicle recorders
Seth Thomas Clock Co., see Thomas, Seth
Shallcross Controls, Inc., 121 N. Broadway, Milwaukee, Wis.
Furnace controls
Shallcross Manufacturing Co., 10 Jackson Ave., Collingdale, Penna.
Rotary Selector Switches with solid silver contacts, accurate instrument resistors 0.1% — 5%, decade resistances & standards, bridges, telephone transmission test sets, resistance thermometers, bonding testers & special instruments for electrical measurements
Shawmut Engg. Co., 179 Freeport St., Boston 22, Mass.
Abrasion testers
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Machine shop gages
Shelby Instrument Co., 321 West 7 St., Long Beach 2, Calif.
Electrical instruments
Sheldon & Co., E. H., Muskegon, Mich.
Laboratory furniture
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Electrical testing equipment



TAG INDICATING INSTRUME TS

For Temperature, Pressure, pH, Lev , Flow and Moisture

Calibrated against recognized standards of highest autho , TAG Indicating Instruments maintain a precise accuracy throug t their ranges.

State your indicating instrument needs and we will su est the proper type for most economical service in your plant.

C. J. TAGLIABUE MFG. CO. **549 PARK AVE., BROOKLYN 5, N. Y.**

Subsidiary of Portable Products Corporation

TAG

Shore Instrument & Mfg. Co., Van Wyck & Carll St., Jamaica 2, N. Y.
Scleroscope hardness testers
(See advertisement on page 87)

Shure Bros., Inc., 225 W. Huron St., Chicago 10, Ill.
Crystal, carbon & dynamic microphones, sound level microphones, vibration pick-ups

Shurite Meters, 61 Hamilton St., New Haven 8, Conn.
Electrical panel & portable instruments
(See advertisement on page 14)

Sickles Co., F. W., Springfield 2, Mass.
Electrical products

Sigma Instruments Inc., 70 Ceylon St., Boston, Mass.
Relays

Signal Electric Mfg. Co., Menominee, Mich.
Fractional horsepower motors

Signal Indicator Co., 894 Broadway, New York 3, N. Y.
Dial lights

Simmonds Aerocessor'es, Inc., 21-10 49th Ave., Long Island City, N. Y.
Specialized aeronautical and engineering accessories

Simplex Time Recorder Co., Sanborn St., Gardner, Mass.
Time recording clocks

Simplex Valve & Meter Co., 6787 Upland St., Philadelphia 42, Pa.
Flow controls, meters, gages, proportioning & ratio control equipment

Simpson Electric Co., 5216 Kinzie St., Austin Station, Chicago 44, Ill.
Electrical instruments

Simpson Optical Mfg., 3200 W. Carroll Ave., Chicago 24, Ill.
Lenses, prisms, optical flats & complete optical systems
(See advertisement on page 59)

Size Control Company, Div., American Machine & Gage Co., 2500 Washington Blvd., Chicago 12, Ill.
Machine shop & special gages, measuring wires

Sjostrom Co., John E., 1711 N. Tenth St., Philadelphia 22, Pa.
Laboratory furniture

Skaneateles Manufacturing Co., Inc., 122 Dickerson St., Syracuse 2, N. Y.
Vacuum gages
(See advertisement on page 102)

Slocomb Co., J. T., 35 Oxford St., Providence 5, R. I.
Micrometer calipers

Small Motors, Inc., 2068 Elston Ave., Chicago 14, Ill.
Universal fractional horsepower motors, dynamotors, shaded pole motors & generators

Smith Control & Instrument Corp., 1329 Highland Ave., Needham 92, Mass.
Thermostats

Smith Meter Co., 5743 Smithway St., Los Angeles 22, Calif.
Gasoline and oil meters
(See advertisements on pages 62, 63)

Snap-on Tools Corp., 8044 28 Ave., Kenosha, Wis.
Torquemeters

Sodemann Heat & Power Co., 2300 Delmar Blvd., St. Louis 3, Mo.
Air conditioned moist cabinet

Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill.
Transformers, automatic voltage adjusters

Solar Mfg. Corp., 285 Madison Ave., New York, N. Y.
Capacitors

Sorensen & Co., Inc., 375 Fairfield Ave., Stamford, Conn.
Chokes, current regulators, voltage regulators, transformers

Sorvall, Ivan, 210 5th Ave., New York 10, N. Y.
Variable transformers
(See advertisement on page 24)

Sound Apparatus Co., 233 Broadway, New York 7, N. Y.
Sound measuring equipment

South Bend Lathe Works, 303 E. Madison St., South Bend, Ind.
Precision lathes

Southern Desk Co., Hickory, N. C.
Laboratory furniture

Sparling, R. W., 945 N. Main St., Los Angeles 12, Calif.
Liquid meters

Specialty Glass Co., 536 Lake Shore Drive, Chicago 11, Ill.
Laboratory glassware

Speedometer Service Co., 131 Fell St., San Francisco, Calif.
Survey footmeter
(See advertisement on page 64)

Speedway Mfg. Co., 1834 S. 52 St., Cicero, Ill.
Skeleton & encased a.c., d.c. & universal motors (1/3000 to 1/3 h.p.) low voltage solenoids

Speidel & Co., Chas. W., 112 N. 12th St., Philadelphia 7, Pa.
Surveying instruments

Spence Engineering Co., Inc., 53 Grant St., Walden, N. Y.
Regulating valves

Sperry Gyroscope Co., Inc., Great Neck, N. Y.
Aircraft & marine navigational instruments

Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J.
Special railway testers

Sperry-Sun Well Surveying Co., 1608 Walnut St., Philadelphia 3, Pa.
Underground surveying instruments for oil wells

Sprague Meter Co., 35 South Ave., Bridgeport 4, Conn.
Liquid meters

Squires Co., C. E., E. 40th St. & Kelly Ave., Cleveland 3, Ohio
Feed water regulators & pump governors

Stafford Co., N., 113 53 St., Brooklyn, N. Y.
Nautical, naval & navigational instruments

Stamford Metal Specialty Co., 427 W. Broadway, New York 12, N. Y.
Panels, instrument & radio test, metal stampings

Standard Areturus Corp., 99 Sussex Ave., Newark, N. J.
Vacuum tubes

Standard Concrete Apparatus Co., 1422 Rhode Island Ave., Washington 5, D. C.
Concrete testing equipment

Standard Electrical Products Co., 400 Linden Ave., Dayton 3, Ohio
Relays

Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.
Electric stop clocks, electric time systems, watt hour meter testing equipment, program clocks, laboratory jack panels & small laboratory table service panels

Standard Gage Co., Inc., 70 Parker Ave., Poughkeepsie, N. Y.
Gages for linear measurements

Standard Science Supply Co., 1232 N. Paulina St., Chicago 22, Ill.
Laboratory supplies

Standard Scientific Supply Corp., 34 W. 4 St., New York 12, N. Y.
Laboratory supplies

Standard Thermometer, Inc., 952 Dorchester Ave., Boston, Mass.
Mechanical thermometers

Standard Transformer Corp., 1500 N. Halsted St., Chicago 22, Ill.
Transformers

Star Compass Co., 110 Antwerp St., East Milton, Mass.
Compasses

Starrett Co., L. S., Athol, Mass.
Precision tools, dial indicators & steel tapes
(See advertisement on page 31)

States Co., 19 New Park Ave., Hartford 6, Conn.
Electricity meter testers

Statham Laboratories, 8222 Beverly Blvd., Los Angeles 36, Calif.
Accelerometers, dynamometers, strain gages, flowmeters, pressure indicators, tension indicators
(See advertisement on page 68)

Stebar Co., 711 W. Lake St., Minneapolis 8, Minn.
Microscopes

Steel City Testing Laboratory, 8843 Livernois Ave., Detroit 4, Mich.
Testing machines

Stephens, Inc., Henry A., 10 E. 52nd St., New York 22, N. Y.
Electrical control instruments

Sterling Inc., 3738 North Holton, Milwaukee 12, Wisc.
Motor operated valves

Stevens-Arnold Co., 22 Elkins St., So. Boston 27, Mass.
Relays, frequency & polarized

Stevens Mfg. Co. Inc., Richland Trust Bldg., Mansfield, Ohio
Controllers, automatic thermostatic, thermostats

Stewart, M. C., Ashburnham, Moss.
Meteorological instruments

Stewart-Warner Corp., 1826 Diversey Parkway, Chicago 14, Ill.
Tachometers

Sticht Co., Inc., Herman H., 27 Park Pl., New York 7, N. Y.
Electrical instruments
(See advertisements on pages 86, 88)

Stillman Co., M. J., Suite 800, 116 So. Michigan Ave., Chicago 3, Ill.
Stop watches

Stockton Profile Gauge Corp., 86 Lafayette St., Salem, Mass.
Profile gages

Stoelting Div., Universal X-Ray Products, 244 N. Homan Ave., Chicago 24, Ill.
Laboratory supplies

Stokes Machine Company, F. J., 5820 Tabor Road, Olney P. O., Philadelphia, Pa.
Special process machinery; pressure & vacuum gages; pellet presses; high vacuum pumps; McLeod vacuum gages; automatic water stills

Streeter-Amet Company, 4101 Ravenswood, Chicago 13, Ill.
Automatic measuring, weighing & counting machines

Stromberg Time Corp., 109 Lafayette St., New York 13, N. Y.
Timing devices & time clocks

Struthers-Dunn see Dunn

Sturtevant Co., P. A., Addison, Ill.
Torque measuring equipment

Sturtevant Mill Co., Harrison Sq., Boston 2, Mass.
Laboratory supplies

Summers Gyroscope Co., 1100 Colorado Ave., Santa Monica, Calif.
Automatic pilots, and gyro servos

Sun Electric Corp., 6323 Avondale Ave., Chicago 31, Ill.
Electrical instruments & engine test equipment

Sun Radio & Electronics Company, 122-124 Duane St., New York 7, N. Y.
Authorized distributors for all major manufacturers of radio parts, tubes, meters, radio test equipment, electronic equipment for industrial use, instruments for laboratory and industrial test purposes, and electronic components for the construction of such instruments

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Balancing machines, pumps, valves

Superior Electric Co., 30 Harrison St., Bristol, Conn.
Industrial & laboratory apparatus

Superior Instruments Co., 227 Fulton St., New York 7, N. Y.
Insulation testers; volt, current & resistance measuring instruments

Superior Meter Co., Inc., 167 41st Street, Brooklyn 32, N. Y.
Gas meters & appliances

Supreme Instruments Corp., Greenwood, Miss.
Radio testing equipment; tube testers, set testers, analyzers, test oscillators, oscilloscopes & dynamic instruments
Gages

Surface Checking Gage Co., 1937 Taft Ave., Hollywood 28, Calif.
Surface roughness standards and comparators

Surface Combustion Corp., 2375 Door Ave., Toledo 1, O.
Dew Point Recorder

Surty Mfg. Co., Inc., 4141 W. Kinzie St., Chicago 24, Ill.
Magnifiers

Suter, Alfred, 200 Fifth Ave., New York 10, N. Y.
Testing apparatus for textiles and metals

Suverkrop Instruments, Box 463, Bakersfield, Col.
Drafting & Surveying instruments

Swain Nelson Co., 2320 Glenview Rd., Glenview, Ill.
Lenses and optical components

Swedish Gage Co. of America, 8900 Alpine Ave., Detroit 4, Mich.
Internal indicators; plug, ring, master disc & special built fixtures

Sylvania Electric Products, Inc., 500 Fifth Ave., New York, N. Y.
Electronic instruments

T

per Instrument Co., 111 Goundry St., North Tonawanda, N. Y.
Testers for measuring wear & abrasion resistance of paints, electroplate, linoleum, leather, textiles; precision stiffness gages for paper, light metallic sheet & wire

ex-West Corp., 2620 S. Park Ave., Chicago 16, Ill.
Special electronic equipment, electronic controls and automatic machinery
(See advertisements on pages 26, 70)

Mabue Manufacturing Co., C. J., Park & Nostrand Aves., Brooklyn 5, N. Y.
Indicating, Recording and Controlling Instruments for Temperature, Pressure, Level, Flow, Humidity; Hydrometers, Chemical Thermometers and Petroleum Testing Instruments; Moisture Meters for Grain, Wood, Tobacco and Granular Materials; Potentiometers, Pyrometers and Resistance Thermometers, Non-Indicating, Recording and Controlling Types; Industrial and Dial-Indicating Thermometers.
See advertisements on pages 25, 67, 71, 76, 98, 122)

Tally-Meter Co., 17 Elmwood Ave., Norwich, Conn.
Counters & measuring machines

Tamms Silica Co., 228 N. La Salle St., Chicago 1, Ill.
Pyrometers

Taylor & Co., W. A., 7300 York Road, Baltimore 4, Md.
Equipment for pH & chlorine control, control of phosphates in boiler water & for water analysis

Taylor Instrument Cos., 95 Ames St., Rochester 1, N. Y.
Indicating, Recording & Controlling Instruments for Temperature, Humidity, Pressure, Rate of Flow, & Liquid Level
(See advertisement on Outside Front Cover)

Taylor Mfg. Co., 3056 West Meinecke Ave., Milwaukee 10, Wis.
Hydraulic dynamometers, static balancing machines, super-accurate drill presses

Technical Associates, 3730 San Fernando Rd., Glendale 4, Calif.
Geiger-Mueller counter equipment; custom built instruments

Technical Instruments, Inc., 51 West 47 St., New York 19, N. Y.
Stop watches
(See advertisement on page 19)

Technical Products Co., 158 Madison Ave., Memphis 1, Tenn.
Laboratory supply house

Technology Instrument Corp., 1058 Main St., Waltham 54, Mass.
Special audio equipment

Tejax Engineering Corp., 2 Allens Ave., Providence, R. I.
Dial indicating handwheels, valve position indicators & V-port hand regulating valves

Tektronix, Inc., 1516 S. E. 7 Ave., Portland 14, Ore.
Cathode ray oscilloscopes & video test equipment

Telechron, Inc., Ashland, Mass.
Timers and fractional hosepower motors
(See advertisement on page 9)

Teleoptic Co., P. O. Box 208, Racine, Wis.
Precision screw products, switches & relays

Televiso Products, Inc., 7466 Irving Park Rd., Chicago 34, Ill.
Electronic products; custom built equipment

Tempil Corp., 132 West 22 St., New York 11, N. Y.
Thermoscopic paint & thermometric sticks

Tenney Engineering Co., 26 Ave. B., Newark 5, N. J.
Controlled temperature & humidity ovens

Testing Machines, Inc., 427 W. 42nd St., New York, N. Y.
Physical testing machines

Testrite Instrument Co., 57 E. 11th St., New York 3, N. Y.
Scientific instruments

Thermal Syndicate Ltd., 12 East 46th St., New York 17, N. Y.
Apparatus, laboratory; flats, optical; gas & vapor discharge tubes, mercury; light sources, mercury vapor; light sources; ultra-violet; optical parts

Therm-O-Disc, Inc., 89 W. Luther Place, Mansfield, Ohio
Thermostats

Thermo-Electric Co., 1012 W. Superior Ave., Cleveland 13, Ohio
Electrically heated & controlled paraffin baths

Thermo-Electric Co., 22-02 Raphael St., Fair Lawn, N. J.
Thermocouples for aircraft engines & industrial uses, extension lead wires & harnesses
(See advertisement on page 92)

Thermo Electric Manufacturing Co., 480 W. Locust St., Dubuque, Iowa
Laboratory furnaces

Thomas Clock Co., Seth, Industrial Sales Dept., Thomaston, Conn.
Household clocks, outdoor & tower clocks, clock movements for industrial purposes, also electric timers

Thomas Co., Arthur H., West Washington Square, Philadelphia 5, Pa.
Dealers, retail-wholesale-export, in laboratory apparatus & reagents for laboratories of chemistry & biology

Thomas & Skinner Steel Products Co., 1118 E. 23rd St., Indianapolis, Ind.
Permanent magnets

Thompson Balance Co., 802 E. 18 Ave., Denver 5, Colo.
Fine balances & weights

Thompson Clock Co., J. C., Bristol, Conn.
Electric stop clocks & interval timers

Thordarson Electric Mfg. Co., 509 W. Huron St., Chicago 10, Ill.
Transformers

Thwing-Albert Instrument Co., Penn St. at Pulaski Ave., Philadelphia 44, Pa.
Pyrometers, paper testing instruments, portable pH meters, general testing instruments & machines
(See advertisements on pages 72, 89)

Times Facsimile Corp., 229 West 43 St., New York 18, N. Y.
High speed recording and communications equipment
(See advertisement on page 83)

Tinsley Laboratories, Inc., 2526 Grove St., Berkeley 4, Calif.
Astronomical instruments, optical instruments

Toledo Scale Co., 1074 Telegraph Rd., Toledo, Ohio
Automatic scales for weighing, counting, check-weighing, compounding, force-measuring, weight-printing & weight-recording; & special devices for testing, classifying & standardizing.

Tork Clock Co., Inc., Mt. Vernon, N. Y.
Clocks, timers, time controllers

Torsion Balance Co., 92 Reade St., New York 13, N. Y.
See Christian Becker, Inc.

Tracerlab, Inc., 55 Oliver St., Boston 10, Mass.
Radioactivity detectors

Transmitter Equipment Mfg. Co., Inc., 345 Hudson St., New York 14, N. Y.
Electronic equipment

Trerice Co., H. O., 1420 Lafayette Blvd., W., Detroit 16, Mich.
Industrial instruments

Triangle Package Machinery Co., 905 N. Spaulding St., Chicago 51, Ill.
Filling machines

Trill Indicator Co., 7000 Bennett, Corry, Pa.
Engine indicators

Trimount Instrument Company, 37 W. Van Buren St., Chicago 5, Ill.
Manometers: well type, sliding scale U-tube, fixed scale U-tube, inclined, obsolute pressure, & service; gages: draft & mercury pressure; indicating flow meters & tank level indicators
(See advertisements on pages 52, 69)

Triner Sales Co., 325 W. Huron St., Chicago 10, Ill.
Scales

Trinity Equipment Corp., 605 Broad St., Newark 2, N. J.
Thermocouple wells
(See advertisement on page 99)

Triplett Electrical Instrument Co., 135 E. College Ave., Bluffton, Ohio
Electrical measuring instruments & radio testing equipment. Also instruments for laboratory and industrial test purposes; switches, relays, resistors, shunts

Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
Radio test instruments

Troemner, Henry, 911 Arch St., Philadelphia 7, Pa.
Balances

Turner Electric Co., 6138 N. Beechwood St., Philadelphia 38, Pa.
Thermowells

U

U C Indicator Sales Co., 152 W. Wisconsin Ave., Milwaukee 3, Wis.
Liquid level gages

Uehling Instrument Co., 473 Getty Ave., Paterson 3, N. J.
CO_2 recorders, vacuum recorders, absolute pressure recorders, draft recorders, combined pressure & vacuum recorders, liquid level gages, pressure & vacuum gages, inclined draft gages, well-type direct reading monometers, U-tube manometers, absolute pressure gages
(See advertisement on page 70)

Ulanet Co., George, 413-15 Market St., Newark 5, N. J.
Thermostats

Ulmer Co., J. C., 1791 E. 38th St., Cleveland 14, Ohio
Surveying instruments

Ultra-Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles 27, Calif.
Fluorescence and ultra-violet lamps
(See advertisement on page 51)

Unertl Optical Co., John, 3551-3555 East St., Pittsburgh 14, Pa.
Optical instruments
(See advertisement on page 60)

Uniform Tubes, Shurs Lane & Lauriston St., Philadelphia 28, Pa.
Precision tubes of all metals

Unimax Switch Corp., 460 West 34 St., New York 1, N. Y.
Switches

Union Tool Company, 48 E. River St., Orange, Mass.
Machine shop gages

United Cinephone Corp., Torrington, Conn.
Electronic devices

United Electric Controls Co., 71 A St., Boston 27, Mass.

United Electronics Co., 42 Spring St., Newark 2, N. J.
Vacuum capacitors and vacuum tubes

United Precision Products Co., Shabbona, Ill.
Gages

LUMINESCENT DIALS . . .

pointers and other components

We can provide your instruments with dials which combine accuracy and handsome appearance with extraordinary readability in daylight, artificial light, or darkness. Many commercial airlines and other instrument users specify our materials as standard.

We design and produce luminescent dials, pointers, and other components; apply self-luminous (radioactive), fluorescent, and phosphorescent materials to dials and components; produce high-accuracy, nonluminescent dials.

Let us show you how scientific application of luminescence can increase the utility of your instrument.

UNITED STATES RADIUM CORPORATION

535 Pearl Street, New York 7, N. Y., Dept. H6

United States Blue Print Paper Co., 207 S. Wabash Ave., Chicago 4, Ill.
Surveying instruments

United States Gauge Div., American Machine & Metals, Sellersville, Pa.
Indicating & recording pressure gages

United States Instrument Corp., 409 Broad St., Summit, N. Y.
Voice powered telephone equipment

United States Radium Corporation, 535 Pearl St., New York 7, N. Y.
Luminescent dials, pointers & other instrument components
(See advertisements on pages 31, 67, 123)

United States Taximeter Co., Div. of Weisinger Recording Instruments Corp., 503 W. 54th St., New York 19, N. Y.
Speedometers, tachometers, taxi meters

United Transformer Corp., 150 Varick St., New York 13, N. Y.
Transformers

Universal Drafting Machine Co., 3110 Payne Ave., Cleveland, Ohio
Drafting Machines

Universal Instrument Co., 306 E. McMillan St., Cincinnati 19, Ohio
Radio tube testers & multimeters

Universal X-Ray Products, 1140 Western Ave., Chicago 22, Ill.
Barometers, manometers, vacuum gages, X-ray equipment

University Apparatus Co., 2229 McGee Ave., Berkeley 3, Calif.
Laboratory supply house

Univis Lens Company, 401 Leo, Dayton 1, Ohio
Optical flats, lenses & prisms

V

Vacutron, Inc., 2819 12th St. So., Arlington, Va.
Special vacuum tubes; electronic circuits & industrial control devices

Valpey Crystals, P. O. Box 321, Holliston, Mass.
Quartz crystals for frequency control

Valvair Corp., 454 Morgan Ave., Akron 11, Ohio
Control valves

Valve Pilot Corp., 230 Park Ave., New York 17, N. Y.
Locomotive speed indicator & recorder and locomotive speed & cut-off indicator & recorder

Valverde Labs., 91 Crosby St., New York 12, N. Y.
Thermal controls

Van Dyke Instruments, Inc., Box 696, Taranza, Calif.
Laboratory apparatus

Van Keuren Co., 176 Waltham St., Watertown, Mass.
Optical comparators & flats

Van Wagner Co., 89-04 113 St., Richmond Hill 18, N. Y.
Inspection devices

Varo Mfg. Co., Box 686, Garland, Texas
Electronic instruments

Vaughn-G. E. Witt Co., 4228 Hollis St., Emeryville, Calif.
Regulating valves

Veeder-Root, Inc., Sargent & Garden Sts., Hartford 2, Conn.
Electrically operated counting devices, a.c. and d.c.

Veritas Firing System Co., P. O. Box 974, Trenton 6, N. J.
Shrinkage discs for ceramic kiln control

Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich.
Pumps & valving devices for control of power in oil-hydraulic systems

Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, O.
Electrometers, spectrometers, vacuum tubes

Viking Instruments Inc., East Haddam, Conn.
Tachometers

Vinco Corp., 9111 Schaefer Highway, Detroit 27, Mich.
Special gages

Visco-Meter Corp., 315 Grote St., Buffalo 7, N. Y.
Viscosimeter

Voland & Sons, Inc., New Rochelle, N. Y.
Analytical balances & weights

W

Wadsworth Electric Mfg. Co., Inc., Covington, Ky.
Electric time switches

Wagner & Son, Carl H., 1944 N. Albany Ave., Chicago 47, Ill.
Thermometers

Walker & Co., Geo. T., 324 Fifth Ave., South, Minneapolis 15, Minn.
Laboratory supplies

Walker-Jimieson, Inc., 311 S. Western Ave., Chicago 12, Ill.
Radio & electronic supplies

Wallace & Tiernan Products Co., Inc., P. O. Box 178, Belleville 1, N. J.
Chlorine control & chemical feed devices, meteorological instruments

Walser Automatic Timer Co., 420 Lexington Ave., New York 17, N. Y.
Timers

Waltham Dial Gage Co., Boxboro Road, Stow, Mass.
Machinist's dial gages

Waltham Watch Co., Waltham, Mass.
Stop watches

Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Resistors, rheostats, relays, motor starters, speed controllers, voltage regulators, electric control devices

Ward's Natural Science Estab., Inc., 302 N. Goodman St., Rochester 9, N. Y.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio
Telescopes

Warren-Knight Co., 136 N. 12th St., Philadelphia 7, Pa.
Surveying instruments & equipment
(See advertisement on page 100)

Warrick Co., Charles F., 16251 Hamilton Ave., Detroit 3, Mich.
Relays & auxiliary equipment for level controls.

Washington Glass Laboratory and Instrument Co., 3224 Georgia Ave., N. W., Washington 10, D. C.
Thermoregulators, thermostats, relays, special glassware

Water Leak Detector Co., 114 N. Third St., Columbus 15, Ohio
Water leak detectors

Water Level Controls Co., 765 Hampden Ave., St. Paul 4, Minn.
Liquid level controls

Waterman Engineering Co., 721 Custer Ave., Evanston, Ill.
Automatic flow controllers

Waterman Products Co., Inc. 2445 Emerald St., Philadelphia 25, Pa.
Portable oscillographs
(See advertisement on page 61)

Watts Regulator Co., 10 Embankment St., Lawrence, Mass.
Automatic pressure regulating devices

Waugh Laboratories, Division of Waugh Equipment Co., 420 Lexington Ave., New York 17, N. Y.
Engineering field service for stress & vibration determination, instruments sale or rental basis, instruments designed & built.

Wayne Automatic Relay Co., 622 Wagner, Fort Wayne 3, Ind.
Photoelectric counters

Webber Gage Co., 12904 Triskett Rd., Cleveland 11, Ohio
Gage blocks

Weber Bros., Metal Works, 108 N. Jefferson St., Chicago 6, Ill.
Laboratory apparatus

Weber & Co., F., 1220 Buttonwood St., Philadelphia 23, Pa.
Mathematical & surveying instruments

Weksler Thermometer Corp., 52-56 West Houston St., New York 12, N. Y.
Thermometers, hydrometers, psychrometers
(See advertisement on page 96)

Welch Engineering Service, F. M., Greenville, Ohio
Abrasion testing machines

Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 10, Ill.
Electrical instruments, vacuum pumps & items for science laboratories.
(See advertisement on page 14)

West & Dodge Thread Gauge Co., Inc., 6 Power House St., South Boston, Mass.
Screw thread gages

Westberg Mfg. Co., 6592 Onarga St., Chicago 31, Ill.
Automotive service instruments, flowmeters, tachometers

Western Electric Co., 195 Broadway, New York 5, N. Y.
Instruments are offered for acoustic, noise or vibration control problems, in the product development laboratory, for field testing and for routine production testing applications
Instruments distributed by Graybar Electric Co., 420 Lexington Ave.
(See advertisement on page 3)

Western Electro-Mechanical Co. Inc., 300 Broadway, Oakland, Calif.
Load testing devices for a-c. circuits

Western Industrial Engineering Co., 3301 Medford St., Los Angeles 33, Calif.
Magnetic inspection unit

Western Machinery Co., 306 W. Second St., Wichita 2, Kansas
Laboratory apparatus

Westinghouse Electric Corp., 306 4th Ave., P. O. Box 1017, Pittsburgh 30, Pa.
Switchboard, panel & portable measuring instruments, aircraft instruments, recorders, industrial & radio test set equipment

Westinghouse X-Ray Co. Inc., 2519 Wilkins Ave., Baltimore 3, Md.
Industrial X-ray equipment

Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Switchboard, panel & portable measuring instruments. Industrial & radio test equipment. Light measuring instruments & photographic exposure meters. Also dial type industrial temperature gages, control relays & aircraft instruments.
(See advertisements on pages 15, 50, 86, 92, 96, 105)

Wheaton Co., T. C. Millville, N. J.
Glassware

Wheatstone Corp., 2819 Reading Rd., Cincinnati 2, Ohio
Thermocouples & pyrometer tubes

Wheelco Instruments Co., 847 W. Harrison St., Chicago, Ill.
Temperature, indicating, recording & control instruments, temperature limit & shut-off device; automatic combustion safeguards
(See advertisements on pages 22, 26)

White Co., Inc., David, 315 W. Court St., Milwaukee 12, Wis.
Surveying instruments

White Mfg. Co., 2362 University Ave., St. Paul 4, Minn.
Furnace controls

White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6, Mo.
Furnace controls

Wilcolator Co., 1001 Newark Ave., Newark B, N. J.
Thermostats

Wilder Inc., R. S., 26 Bedford St., Waltham, Mass.
Microprojector

Wilder Sales Co., 15 Euclid Ave., Troy, N. Y.
Thermometers

Wilgus Mfg. Co., 1722 East 16th St., Los Angeles 21, Calif.
Diaphragm operated pressure regulators & combustion control equipment

Wilkening Mfg. Co., 1998 S. 71st St., Philadelphia 42, Pa.
Piston ring gages

Wilkens-Anderson Co., 111 N. Canal St., Chicago 6, Ill.
Laboratory supplies

Will Corp., 39 Russell St., Rochester 3, N. Y.
Laboratory supplies & apparatus

William Apparatus Co., Inc., Herald Bldg., Watertown, N. Y.
Pulp & paper testing equipment & flue gas analysis apparatus

Williams, Brown & Earle, Inc., 918 Chestnut St., Philadelphia 7, Pa.
Laboratory supplies

Williams Gauge Co., 1620 Pennsylvania Ave., Pittsburgh 12, Pa.
Water level gages

Willson Products, Inc., Reading, Penna.
Anemometers

Wilmotte, Inc., Raymond M., 1469 Church St. N. W., Washington, D. C.
Electronic gaging instruments

Wilson & Co., G. C., P. O. Box 389, Chatham, N. J.
Remote-control and remote-metering equipment

Wilson Mechanical Instrument Co., Inc., 383 Concord Ave., New York 54, N. Y.
Hardness testers

Winslow Co., Inc., 9 Liberty St., Newark 5, N. J.
Ignition hardness test sets, aircraft engine instruments, thermocouples & instrument accessories, tachometers, vacuum gages, radio & telegraph keys, molded rubber cord sets, megohmeters, Wheatstone bridges
(See advertisement on page 88)

Witt Gage Co., Eau Claire, Wis.
Pressure gages

Wollensak Optical Co., 880 Hudson Ave., Rochester 5, N. Y.
Optical instruments

Wood, Harry W., 2319 35th Ave., Oakland 1, Calif.
Diaphragm valves and controllers

Woods "Lab. Apparatus", F. W., 140-6 Warden St., Pittsburgh 20, Pa.
Biological laboratory supplies

Woods Hole Oceanographic Inst., Woods Hole, Mass.
Oceanographic instruments

Woodworth Co., N. A., 1365 Jarvis Ave., Detroit 20, Mich.
Gages for physical measurements

Worley Jewel Co., John, Waltham, Mass.
Jewels & pivots

Worner Electronic Devices, Rankin, Ill.
Photoelectric products

Worthington-Gamon Meter Company, Harrison, N. J.
Liquid meters

Wroble Engineering Co., 1067 Davis Terrace, Schenectady 3, N. Y.
Universal testing machines

Wyland, George C., Center St., Ramsey, N. J.
X-Ray tubes & cameras

X

Xervac Instrument Co., 9 New Park Ave., Hartford, Conn.
Scientific instruments

Y

Yankee Precision Products Co., 50 Bartholomew Ave., Hartford 6, Conn.
Gages & electronic inspection devices

Yardeny Engineering Co., 105-107 Chambers St., New York 7, N. Y.
Remote control systems

Yarnall-Waring Company, 102 E. Mermaid Lane, Chestnut Hill, Philadelphia 18, Pa.
Water columns, water gages & blow-off valves for steam boilers, spray nozzles for liquids & hydraulic valves for presses

Yonkers Lab. Supply Co., 515 W. 132 St., New York 27, N. Y.
Laboratory supplies

York Ice Machinery Corp., York, Pa.
High altitude test & calibration chambers

Z

Zeiss, Inc., Carl, 485 Fifth Ave., New York 17, N. Y.
Optical instruments

Zenith Electric Co., 152 W. Walton St., Chicago, Ill.
Magnetic switches, work cycle timers

Zenith Optical Co., Huntington 19, W. Va.
Microscopes, lenses, optical flats

Zenith Optical Laboratory, 123 W. 64th St., New York 23, N. Y.
Lenses, mirrors

Zernickow Co., O., 15 Park Row, New York 7, N. Y.
Tachometers, tachographs, tachoscopes, cutmeters, stop watches

Zuhr, Inc., Henry, 237 Lafayette St., New York, N. Y.
Laboratory test instruments

UTOMATIC CONTROL QUIPMENT

ENGINEERED DESIGN BY **HAMMEL-DAHL**

FLO-TESTED*
IAPHRAGM CONTROL VALVE
APPLICATIONS

These Standard Control Valves are designed for use with air operated instruments for control of pressure, temperature, liquid level, rate of flow, humidity or pH.

They can be applied with equal efficiency on air, water, steam, oil or gas service and are available in sizes from ½" to 12".

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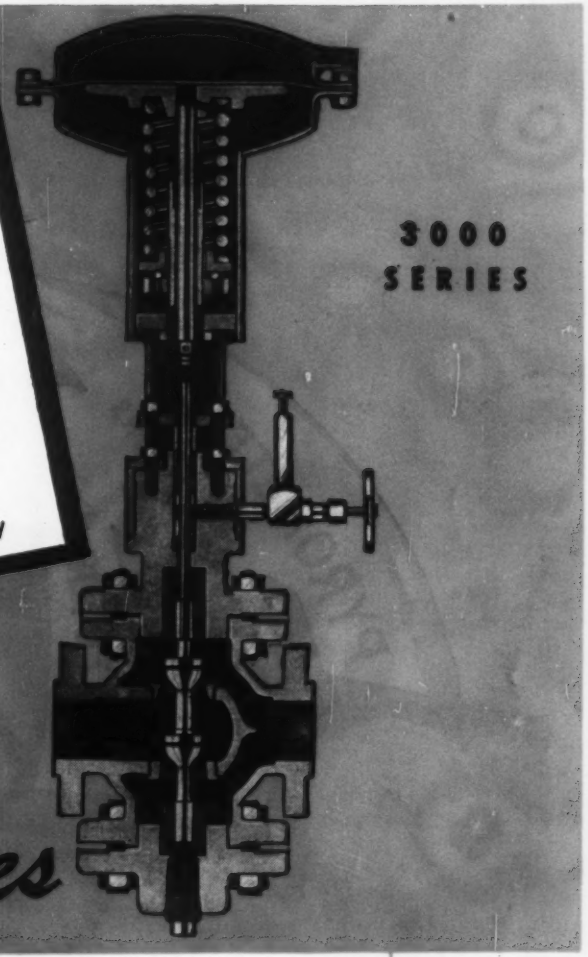
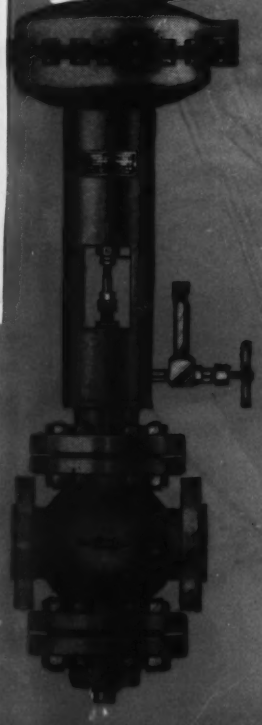


3000 SERIES



Design Features

The ALLSTEEL Superstructure is fabricated from 3/16" steel stampings.
Oilite Bearings eliminate spring stem friction.
Stainless steel spring stem standard.
Packing box bolted on all size valves.
Bonnets and blind heads are forged fabricated.
Bonnets will support ALLSTEEL Superstructure if installed horizontally.
They are through-bolted for greater strength and also to provide simplicity of field reversal.
Valve bodies have ASA Standard Face to Face dimensions.

FAMOUS *Hammel-Dahl* FIRSTS

All valve plugs are top and bottom guided in hardened stainless steel bushings.
Valve action reversible in the field, requiring no additional parts.

HAMMEL-DAHL COMPANY

243 RICHMOND STREET PROVIDENCE, R. I.

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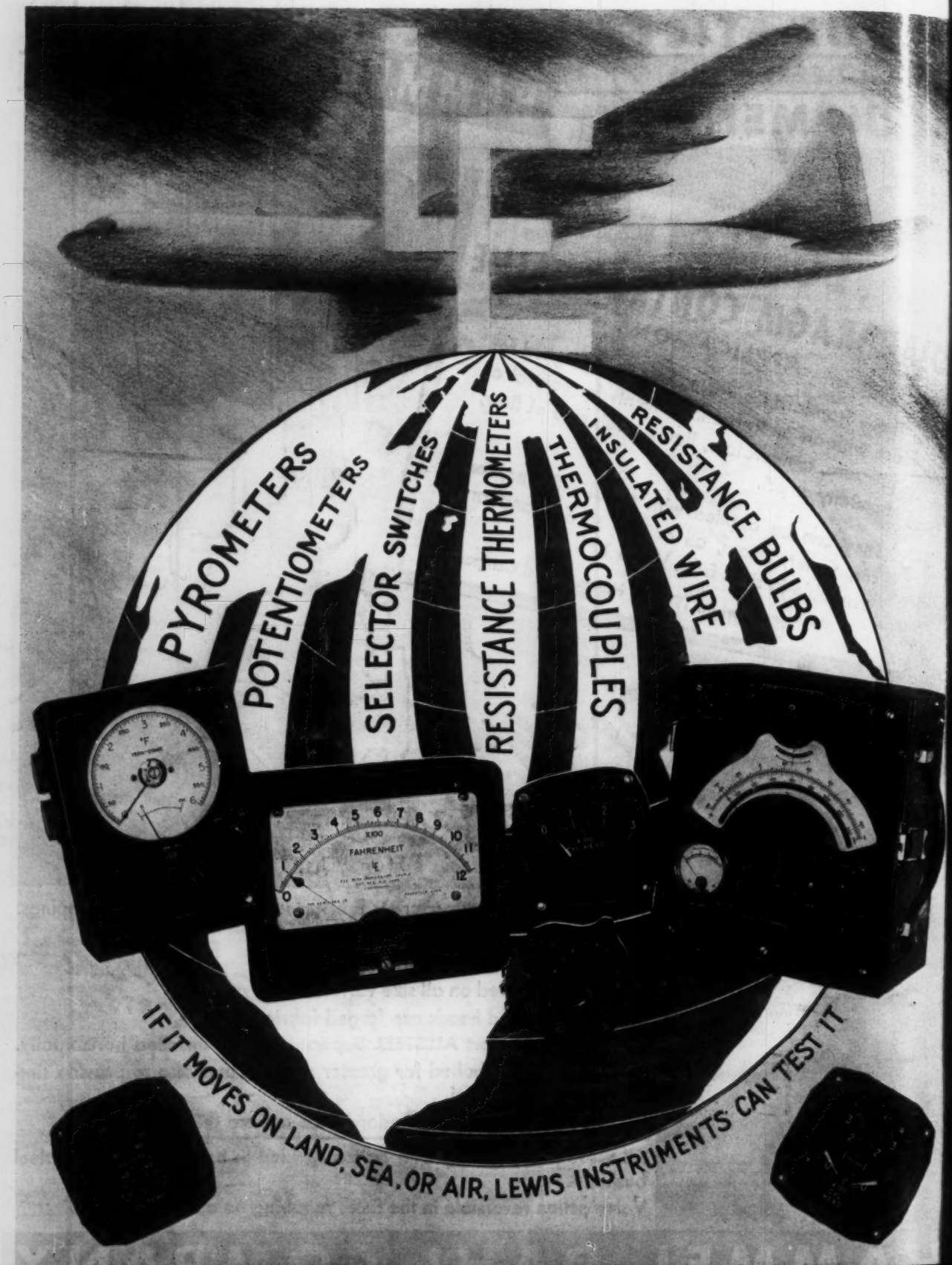

THE LEWIS ENGINEERING CO.

Specialists in Electrical Temperature Measurements

NAUGATUCK, CONNECTICUT.